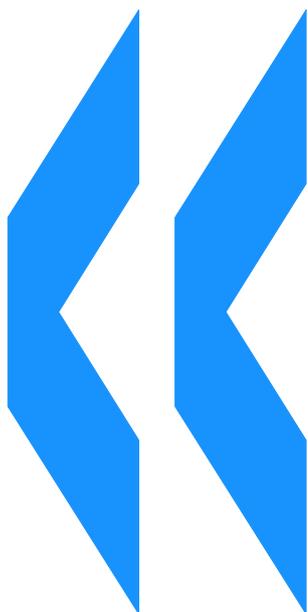


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OECD Reviews of Higher Education in Regional and City Development

The State of Penang, Malaysia

SELF-EVALUATION REPORT

**Morshidi SIRAT, Clarene TAN and Thanam
SUBRAMANIAM (eds.)**



Directorate for Education

Programme on Institutional
Management in Higher Education (IMHE)

This report was prepared by the National Higher Education Research Institute (IPPTN), Penang, Malaysia in collaboration with a number of institutions in the State of Penang as an input to the OECD Review of Higher Education in Regional and City Development. It was prepared in response to guidelines provided by the OECD to all participating regions. The guidelines encouraged constructive and critical evaluation of the policies, practices and strategies in HEIs' regional engagement. The opinions expressed are not necessarily those of the National Higher Education Research Institute, the OECD or its Member countries.

Penang, Malaysia Self-Evaluation Report

Reviews of Higher Education Institutions in Regional and City Development

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Editors

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ACRONOMYS AND ABBREVIATIONS

AARG	AIDS Action Research Group
ASTW 2008	Asean Science and Technology Week
AMDI	Advance Medical and Dental Institute
APEX	Accelerated Program for Excellence
ACMFF	Australian Cranio- Maxillo Facial Foundation
ATAP	Malaysian Museums Association and Association of Tourist
AIDAAS	Delivery and Access Solution
AIM	Amanah Ikhtiar Malaysia
AMD	Advanced Micro Devices
ASTS	Academic Staff Training Scheme
APO	Asian Productivity Organisation
BiotechCorp	Malaysian Biotechnology Corporation
BJIM	Division of Industry and Community Network (USM)
CASP	Community AIDC Services of Penang
CAT	Competency, Accountability, Transparency
CEDEC	Collaborative Micro- Electronic Design Excellence Centre
CDER	Centre of Drugs Research
CSDD	Corporate and Sustainable Development Division
CenPRIS	Centre of Drugs Research
CPI	Corporate and Sustainable Development Divison
CIP	Centre for Policy Research and International studies
CPI	Competition Policy Intrnational
DAGS	Consumer Price Index
E&E	Cradle Investment Program
ESD	Demonstrator Application Grant Scheme
FTZ	Electrical & Electronics
GDP	Education for Sustainable Development
GLP	Free Trade Zones
GOM	Gross Domestic Product
EPZ	Good Laboratory Practices
HEI	Government of Malaysia
ICOM	Export Processing zone
ICT	Higher Education Institutions
IPTTAR	International Council of Museum
IP	Intellectual Property
INSPIRE	Industry Networking system Promoting Industry Relevance Employability
INFORMM	Institute for Research in Molecular medicines
IAP	Industry Advisory Panel
ISDEV	Centre for Islamic development
IGS	Industrial R&D Grant
IEAUK	International Entrepreneurs Association of the United ZKIngdom
IRPA	Intensification of Research in priority Areas
IT	Information andTechnology
IXC	Innovation Exchange Malaysia

IPHARM	Malaysian Institute of Pharmaceuticals Nutraceutical
JMTI	Japan Malaysia Technical Technical Institute
KANITA	Wome’s Development Research Centre
KAIST	Advanced Institute of science and Technology
KLCC	Kuala Lumpur Convention Centre
MATRADE	Malaysia external Trade Development Corporation
MTE	Malaysian technology Expo
MDeC	Multimedia Development Corporation
MIDA	The Malaysiab Industrial Development Corporation
MITI	The Ministry of International Trade and Industry
MSMA	Manual Saliran Mesra Alam
MMU	Multimedia University
MIFB 2008	Malaysian International Food & Beverage Trade Fair 2008
MAHA2008	Malaysian Agriculture, Horticulture & Agro tourism Show 2008
MNCs	Multi-national Corporations
MOHE	Ministry of Higher Education
MPPP	Majlis Perbandaran Pulau Pinang (Penang Municipal Council)
MGS	MSC R&D Grant Scheme
METEOR	Multimedia Technology Enhancement Operations Sdn. Bhd
MPSP	Majlis Perbandaran Seberang Perai
MITI	The Ministry of International trade and Industry
MQA	Malaysian Qualifications Agency
MQR	Malaysian Qualifications Register
MBA	Master in Business Administration
MSC	Multimedia Super Corridor
MEWC	Ministry of Energy Water & communication
NCER	Northern Corridor economic Region
NATPRO	Natural Product Expo 2008
NGO	Non – Government Organisation
OECD	Organization for Economic Co-operation and Development
OVOP	One Village One Product
PCC	Penang Cyber City
PEWOG	Penang Environment Working Group
PDC	Penang Development Corporation
PEACE	Research and Education for Peace Unit
PRN	National Poison centre
PSDC	Penang Skills Development Center
PERDA	Penang Development Regional Authority
PECC	Penang Educational consultative Council
PRO	Public Relation Office
R&D	Research and Development
RDF	Commercialisation of R&D Fund
PCC2	Penang Cyber city 2
PCC3	Penang Cyber City 3
QAD	Quality assurance Divison
RCMO	Research Creativity and Management
REDAC	Urban Drainage Research Centre
RESCAM	Regional Centre for Education in Science and Mathematics

SCoPe	Software Consortium of Penang
SEDC	State economic Development Corporation
SERI	Sustainable Penang Initiatives
SMEs	Small and Medium – sized Enterprises
SOPs	Standard Operating Procedures
SEAP	SME export Advisory Panel
SMIDEC	Small and Medium Industries development Corporation
SPI	Sustainable Penang Initiatives
SETARA	Malaysian Benchmarking System for Institutions of Higher Education
TARC	Tunku Abdul Rahman College
TAF	Technology Acquisition Fund
TAF	Technology Acquisition Fund
TGMF	Tunku fauziah museum and Gallery
TLO	Technology Liciencing Office
OUM	Open University Malaysian
UNESCO	United Nations Educational scientific and Cultural organization
USM	Universiti Sains Malaysia
UNU-RCE	United Nation University’s regional Centre for Excellence
UKQAA	United Kingdom Quality Assurance Agency
UPEN	Unit Perancang Ekonomi Negeri
UITM	Universiti Teknologi Mara
WWP	Water Watch Penang
WWP	Wawasan Open University
WHO	World Healthy Organisation

FOREWORD

1 This self-evaluation report (SER) for the Penang region was prepared by the working group commissioned by the Regional Coordinator for the Penang region. This SER was conducted when Penang was experiencing a very unsettling time as a result of several important political and global developments. The impact of these developments, in particular, the global financial crisis, was felt midway in the study with implications on regional development. Admittedly, the regional stakeholders who were consulted for their inputs and comments are more concerned with the future of their operations, businesses and the political situation, and are not able to cast a wider or longer term view of the Penang region as expected. Their concerns are very immediate in nature. In light of the predicament they are facing, we should not expect too much from them. Nonetheless, we are appreciative of their contributions.

2 This SER is primarily an evaluation of the working group based on their analysis of the limited survey that was undertaken. However, more importantly, many members of the working group are also members of many community and voluntary organisations in Penang and as such, they were able to engage their respective organisations for contribution of ideas, input and comments. Universiti Sains Malaysia, the Penang Tertiary Education Sub-Committee and the Socio-economic and Environment Research Institute (SERI) have been very forthcoming in providing support, data and other relevant information.

3 We are grateful to Universiti Sains Malaysia for allowing the Institut Penyelidikan Pendidikan Tinggi Negara (IPPTN) to lead this study.

EXECUTIVE SUMMARY

Overview of the Region

4 The Penang city-region commands an important position in the national spatial system after the core region. After losing free port status in the 1960s, Penang's strategic location as the centre for the electrical and electronic (E&E) industry was fully exploited in the 1970s and 1980s. In the 1980s, Penang became an important regional industrial complex for the production of semiconductors and other related products in Malaysia and the Asia Pacific region. Arguably, the regional development strategy in the 1980s and 1990s was based on the objective of maximising opportunities within the global production networks of the E&E, textile and garments industry. Integration with the global economy has impacted society's composition structurally and socially.

Characteristics of the Higher Education System

5 In the last 40 years, Universiti Sains Malaysia, as one of the leading higher learning institutions in the Penang city-region, has played major roles in reshaping the socio-economic, demographic and cultural fabric of Penang.

6 Social networking with various government and non-governmental organisations (NGOs) has also allowed Universiti Sains Malaysia to contribute to the development of specific communities in Penang. Activities such as research collaborations and student internships with various industries in Penang have indirectly pushed Universiti Sains Malaysia to play the role of social brokerage in the development of Penang. More recently, the establishments of Wawasan Open University (WOU) and other private higher education institutions have reinforced the important role of higher education institutions in regional development.

7 The present centralised governance system of the Malaysian higher education sector poses considerable constraints that hinder public universities to fulfill their potential to the fullest and be classified as 'world-class' universities. It is noteworthy that public and private higher education institutions operate under different regulatory and financing rules, resulting in the absence of a unified higher education system. To date, development plans for these two sectors are undertaken separately.

8 Looking back, the establishment of Universiti Sains Malaysia in 1969 outside the traditional core region reflects a bold attempt to use higher education as an instrument to redress ethnic inequity and regional imbalances. Since its establishment, Universiti Sains Malaysia has registered significant milestones and accomplishments in teaching and learning, and research and innovation. The university has strategised its responses to globalisation, marketisation and internationalisation by providing and maintaining good infrastructure, over time becoming more competitive at the national and global level.

9 The academic programme at Universiti Sains Malaysia is based on three main principles. First, the courses offered have to meet the country's requirements and interests. Second, the form and functions of its education have to be different from those offered by other local universities, while at the same time, ensuring a balance between courses. Third, the university has to provide for research and the accumulation, advancement and dissemination of knowledge. It also has to strive to match its education and research programmes to the requirements of society.

10 In September 2008, Universiti Sains Malaysia was the first university to be accorded the Accelerated Program for Excellence (APEX) status by the government of Malaysia. In transforming its higher education agenda, Universiti Sains Malaysia has set out to achieve the following goals: eliminate/reduce bureaucracy, the resource gap and talent mismatch; raise its global agenda, autonomy,

accountability, quality of services and future relevance; create ‘people-led’ local solutions; and promote sustainability in its functions.

Contribution of Higher Education Institutions to Research and Regional Innovation

11 Universiti Sains Malaysia is embarking on research programmes via strategic planning and implementation of its research and development (R&D) mechanisms. The strong research areas of Universiti Sains Malaysia include environmental science, aquaculture, biomedical and pharmaceutical studies, natural language processing and computer aided translation, information technology, food technology, polymer science and technology, biotechnology, distance education, geographical information system, structure analysis, materials science, engineering, surface chemistry and robotic vision.

12 To move forward in R&D, higher education institutions must develop collaborative efforts with the industry. The barrier in the higher education institution-industry relationship comes from the traditional mindset of both sides. Academics feel that in order to preserve their academic integrity, they need to conduct high quality research within their research areas. Those in the industry on the other hand, perceive that the research done by academics have very little application in the industry. This mindset is slowly and gradually being challenged as both sides have begun to recognise the need to collaborate and interact.

13 Universiti Sains Malaysia has long acknowledged that strategic alliance with the industry (both the larger enterprises and small and medium enterprises (SME)) is an important approach that could complement the national innovation system. This is in response to the economic demands faced by the nation and in accordance to the blueprints from the Malaysian Ministry of Education (2001–2010) (Kementerian Pendidikan Malaysia, 2001), Knowledge-based Economy Masterplan (ISIS, 2002) and National Higher Education Strategic Plan, 2020.

14 Important mechanisms for technology transfer between the higher education institutions and regional stakeholders are joint research activities, consultancy and student projects. Collaboration or contracts are also initiated by InvestPenang or Penang Development Centre (PDC). Funding mechanisms (such as Cradle Fund) ensure more profit to be gained by collaborating with researchers from higher education institutions.

15 Generally, higher education institutions in the region do not have courses that are specially designed to meet Penang’s needs or are drawn up based on the specific characteristics of Penang. To enhance students’ understanding and ensure that the course content is relevant to the local context, usually, the national rather than the regional (state) characteristics are touched upon during the teaching and learning process. Nevertheless, the nature of the industry in Penang, which is more electronic based, does encourage private higher education institutions to offer more electronic engineering programmes as compared to other engineering programmes to meet the labor needs of the local industries.

16 Higher education institutions in the region have established networking with the local industries via specific divisions within their individual institutions. Examples are the Division of Industry and Community Network (BJIM), the Division of Research and Community Network and the Industrial Development Unit at Universiti Sains Malaysia, Universiti Teknologi MARA (UiTM) Penang and INTI International College Penang respectively. While originally, the networking established was mainly for industrial training placement and to enhance students’ employment opportunities, the institutions are now actively taking part in community engagement and outreach programmes.

17 At a public research-APEX university such as Universiti Sains Malaysia, the postgraduate research activities are geared towards meeting the regional and national needs. Given that the institution has been identified as a research intensive university, its linkage with the industry plays a critical role in promoting R&D in the region. There is, however, a lack of postgraduate research activities at other higher education institutions in the region due to certain limitations. Coalitions of regional experts are only evident at Universiti Sains Malaysia.

Contribution of Higher Education Institutions in terms of Teaching and Learning to the Labour Market and Skills

18 Higher education institutions in Penang do not have specific policies on student recruitment and employment in the region. Each higher education institution has its own strengths to attract students from outside the region. Universiti Sains Malaysia, as the only research intensive higher education institution in the region, has a top reputation for providing excellent education programmes, particularly at the postgraduate level. The university has fast gained international recognition over the last decade.

19 Regional collaborations among the universities in the region, related to the contribution of teaching and learning to the labour market and skills, take place on a voluntary basis and are mostly ad hoc in nature.

20 Traditionally, the Penang Educational Consultative Council (PECC) under the state government provides the mechanism for a coherent vision of an education system at the regional level. However, this is only for the private higher education institutions in the state.

Contribution of Higher Education Institutions to Regional Networking

21 BJIM, at Universiti Sains Malaysia, serves as the pathway between the university and regional firms. This division provides the industry and community with a comprehensive database of the expertise, facilities and resources available at the institution. In addition, the Corporate and Sustainable Development Division (CSDD) explores opportunities for the institution to engage efficiently in business and research with regional, national and international organisations. As compared to Universiti Sains Malaysia, the pathways between other higher education institutions and the regional firms are not so established.

22 Opportunities for lifelong learning through Open University Malaysia (OUM) and WOU, and for distance education through Universiti Sains Malaysia have significantly improved access to higher education.

Contribution of Higher Education Institutions to the Social, Cultural and Environmental Development

23 It is in the area of infrastructure facilities and services that the region's institutions of higher education have generously avail themselves to the general public and civil society organisations. Situated in a culturally diversified city that is equally rich in its heritage and history, the key higher education institutions in the region, namely Universiti Sains Malaysia and WOU, certainly contribute to the region's cultural development and advancement. Cultural activities in the city take the form of performances (such as theatres, concerts and dances), exhibitions (such as art and book exhibitions), festivals (traditional cultural festivals as well as film festivals from foreign countries) and education programmes (mainly geared towards creating awareness among the public on cultural issues). Increasingly, through the adoption of sustainability, Universiti Sains Malaysia has been developing strong linkages with the community.

Capacity Building for Regional Cooperation

24 Generally, higher education institutions in Penang engage the community in the region in varying ways. Some higher education institutions, especially those which are government-funded, have formal mechanisms in the form of a special division which is set up to form a link with the community and industry. Others may engage with the industry and community but they may not have a formal division/department that specifically oversees the engagement.

Challenges for Increasing the Contribution of Higher Education Institutions to Regional Development

25 In Malaysia, educational provision falls under the purview of the federal government. The state government has no direct influence over higher education institutions although a state representative may sit on the university board by invitation. At best, cooperation between higher education institutions and the state government exists on an ad hoc basis, as and when the state government needs particular help from the higher education institutions. Even the hiring and recruitment policies at higher education institutions are governed by federal rulings. Given such background, human resource policies at any public higher education institution do not have regional dimensions incorporated into them.

26 In charting the path towards regional engagement and sustainable development, higher education institutions need to focus on promoting new organisational culture, initiating a process of internal reform to strengthen the management capability and integrate regional engagement and sustainability into its core activities. As Universiti Sains Malaysia is one of the higher education institutions in the region that values the said agenda, the ingraining of a new culture is seen as crucial.

27 This self-evaluation exercise was undertaken with several objectives in mind. First, it was undertaken to provide a comprehensive background on the Penang city-region, emphasising its socio-economic and cultural assets, and the development and changes of these assets over time. The second objective was to determine the extent to which these changes have been the result of the interaction between various forces in the region, in particular, higher education institutions. In this regard, it was pertinent to trace the changes in the region arising from the dynamics and interplay of internal and external forces, and the interactions between various actors and stakeholders. Central to the assessment was the critical and important role of higher education institutions.

28 This self-evaluation report has provided some indication of the future prospects of the Penang city-region based on the extrapolation of past trends. However, some discerning features of the future are deeply rooted outside of the region.

29 While it is acknowledged that higher education is within the purview of the central government, it is very important that the state government sets clear directions with respect to synergy and collaboration among higher education providers in the region.

INTRODUCTION: REVISITING THE ROLE OF THE UNIVERSITY

University and Beyond

30 Universities have always been regarded highly by society as knowledge generator. Newman (1909) refers to university as the 'School of Universal Learning'. He further describes that university is a place where scholars of every discipline from all over the world meet. It is a place where scholars and students exchange ideas via the circulation and communication of thoughts. Newman's idea of university is not contained within the four walls of a university, but it extends to all levels and experience of life. To learn about being a good statesman, a candidate should be exposed to the affairs of the Parliament where he would learn politics by the discourse and discussion from experienced statesmen. By observing and experiencing the atmosphere exists in Parliament, the candidate will be trained more effectively than just by extracting knowledge from the printed materials, such as textbooks. As an example, Newman indicates that the Houses of Parliament are a sort of university specialized in politics.

31 Newman's definition of a university is not limited to the institution itself. The learning process covers all areas of life and stresses on real situation and people as the basis to acquire knowledge.

32 As of today, the idea of a university stretches far beyond knowledge acquisition or generator. Discussion on what a university is or should be has entailed many to question the purpose of a university and its contribution to society and nation. In relation to society and nation, a university then cannot be an exclusive survivor. We see Newman's idea of university springs to life when we discuss a university's contribution and roles in relation to the entities surrounding it. As Newman sees different institutions as some sort of universities or ideal place for learning, today's university plays the role of engaging these institutions to improve knowledge production which in turn serves to enhance social and national development. More importantly is the role of university in engaging the entities in the region where the university is situated. The question is how does a university engage those entities and what role does a university play?

Roles of the University

33 Emphasis on the role of university over the period of time has changed. The social role of university as stressed by Humbolt and the German Idealists has been slowly losing its importance as the question of a university's contribution in other domains picks up attention. Cowan (2005) describes the social role of university as in the German case was to strengthen national identity. This was done by teaching the same tradition to all students to create unity with the objective to produce good citizens who could function well, ambitious and lastly, contribute to the nation as a whole. Usually, such tradition was based on literature in the respective language that speaks about a nation's culture. By that, university was to instill such culture in each student to build a cohesive society.

34 However, the emergence of internationalization has rendered university a new role. A graduate is not expected only to serve his country by learning his national culture; he also has to learn about global and international affairs in order to be a competitive citizen. Nation cannot survive by ostracizing itself. Thus, the increased cooperation and collaboration between countries demand citizens to contribute more than just being a good cultured citizen. University has to be more international-oriented to fulfill its role in producing globally competitive citizens. All in all, the economic importance has become more intense and universities are involved to supply skilled workforce at the level of the nation and region.

35 Subsequently, the world is now moving further away from the emphasis on social contribution with the emergence of knowledge economy and innovation. Universities are now engines of economic

regional development. In this new role, university is expected to engage itself with the society, particularly the industry sector, which is also the thrust of economic development. The German who placed emphasis on social contribution of university historically (Cowan, 2005) was also the pioneer of university-industry linkage. In the early 19th century, pharmaceutical industry in Germany was created by the collaboration of university and industry (Chakrabarti & Rice, 2003).

36 The idea of university being an “ivory tower” where intellectual activities take place and where scholars are able to spend long time deep in contemplation no longer appeals to society. This is exacerbated by the increase of private sector venture into the higher education domain. To some extent, public university has been pressured to search for funding besides funds from the government. More public universities face increased pressure as level of public funding is getting less. Universities have to look to other means to maintain their operation. ‘Social’ universities are now ‘entrepreneurial’ universities. For example, in Finland, universities seize the opportunities to establish network with the industry by building incubators or enterprise development centres that house entrepreneurial firms (Chakrabarti & Rice, 2003).

37 Efforts are being made to yield income to support research activities and industry is considered to be one of the most promising sources of funding for research. As the level of engagement between industry and university is gaining more stability and popularity, the role of university which focuses mainly on intellectual capacity evolves into promoting regional development. University acts as central engine to development by providing the necessary expertise/knowledge which link industry, community, stakeholders and government.

The Role of Universities in Malaysia

38 The National Higher Education Strategic Plan clearly discusses the role of higher education in Malaysia. It calls upon transformation of higher education to produce human capital for the nation. By this, human capital does not refer only to graduates as workforce but it bears down to the very basic description of mankind’s good attributes. It covers three important characteristics, i.e. knowledge, personal and interpersonal. These characteristics enshroud both physical and mental capability of mankind in what the plan labels as ‘human capital with first-class mentality’. An expert of an area is encouraged to have knowledge in multi-discipline, strong sense of ethics and leadership skills.

39 Research and development (R&D) is another prominent focus of the plan that emphasises on collaboration between universities, local companies, multi-national corporations (MNC) and leading research institutes. R&D is seen as critical in bringing Malaysia to a higher level in the global value chain by the creation of new jobs and opportunities, creating new knowledge to turn Malaysia into an education hub and developing innovative human capital across all sectors of economy.

40 Malaysia’s idea of universities aims to develop the ‘ideal’ human capital which has knowledge of the world and yet has all the positive values of humanity. This human capital has the spiritual attributes and material knowledge to be an all rounded citizen. Although R&D is emphasised, the central idea of university’s role is to develop the personal growth of a student which is believed to be the pillar for further contribution of the mind and labour.

CHAPTER I: OVERVIEW OF THE PENANG REGION/CITY REGION¹

Introduction

41 **‘Pulau Pinang’** or literally meaning, **‘Isle of the Betel Nut’** is one of the thirteen states of Malaysia. It became known as ‘Penang’ when the island was ceded to the British East India Company by the Sultan of Kedah in 1786. The strip of land on the mainland opposite the island was also later ceded to the British East India Company in 1800. Penang, also popularly known as **‘Pearl of the Orient’**, is an international tourist destination famous for its many attractions which are steeped in history as well as for its scenic beauty with white sandy beaches, beautiful landscape and its unique and diverse cultures. Although growth and development has made Penang one of the most successful states in the nation, it has managed to retain most of its historical charm. On 7 July 2007, Penang along with Malacca, another state in Peninsula Malaysia, were named as World Heritage Sites by the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

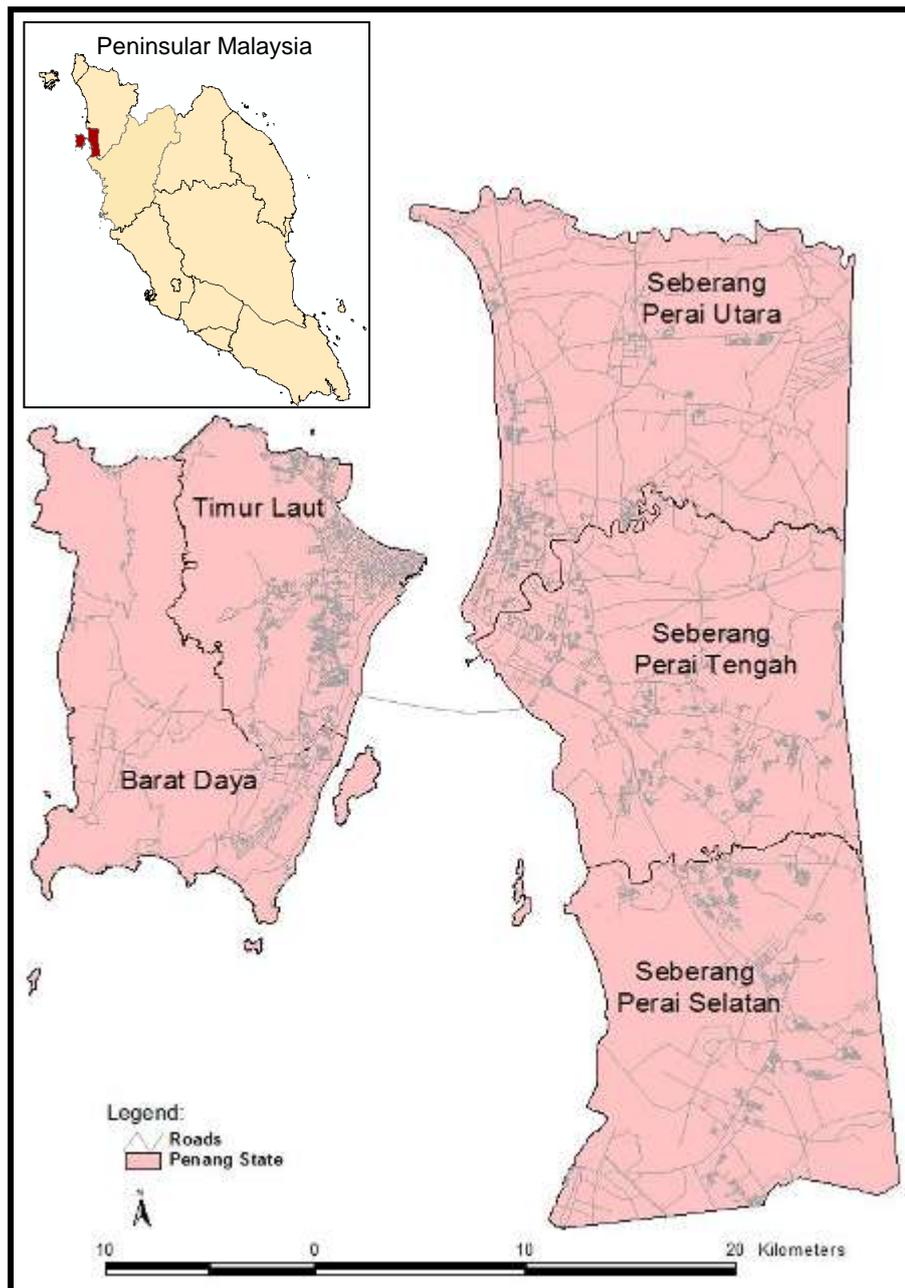
1.1 The Geographical Situation

42 Penang is located in the northern region of Peninsular Malaysia between 100 ° 8’E and 100 ° 32’E, longitude and 5° 8’N and 5 ° 35’N, latitude. Its area is approximately 1,030 square kilometers, consisting of two separate areas, namely the Penang Island and Seberang Perai on the mainland. The Penang state has five administrative districts, namely the North-East district (daerah Timur Laut) and South-West district (daerah Barat Daya) on Penang Island; and the Northern Seberang Perai district (daerah Seberang Perai Utara), Central Seberang Perai district (daerah Seberang Perai Tengah) and Southern Seberang Perai district (daerah Seberang Perai Selatan) in Seberang Perai (formerly known as Province Wellesley). Please refer to Map 1.1.

43 The rich and diverse cultures of Penang originated from the mixture of cultures from the eastern and western civilizations. The state is a microcosm of a multi-racial, multi-religious, multi-cultural and multi-lingual society. The Malay, Chinese and Indians are among the major ethnic groups in the state. The common languages of Penang, depending on social class and circles as well as ethnic backgrounds are English, Penang Hokkien, Tamil and Malay.

44 The built environment can be described as a living museum that represents the link between Penang’s past history and the present which is home to diverse communities and cultures. Notable community buildings and monuments such as the Lebuah Acheh Mosque, Kapitan Keling Mosque, Goddess of Mercy Temple, Khoo Kongsi, St. George’s Church and Sri Mahamariamman Temple are frequently visited by local and foreign tourists.

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Map 1.1. The state of Penang — the study area

Source: Department of Town and Country Planning (2009)

45 Due to the state's importance in economic development, various infrastructures have been developed to provide better accessibility between Penang and other parts of Malaysia. The state, for example, can easily be accessed from other major cities such as the national capital (Kuala Lumpur) and major centres of economic and cultural activity (Alor Setar, Ipoh, Johor Bahru, Kota Bahru) in Malaysia by land using the North-South Expressway, East-West Expressway or National Railway; by air through the Bayan Lepas International Airport; and by port through the North Butterworth Container Terminal.

46 George Town, the state capital of Penang is located on the island is the central business and administrative zone of Pulau Pinang. This city was once the main business centre for Penang and

regional centre for the northern region of Peninsular Malaysia. The George Town conurbation plays a significant role in supporting economic and urban growth of neighboring towns such as Kulim, Sungai Petani and Gurun in the state of Kedah, and Selama and Parit Buntar in Perak. New development corridors have emerged, namely the Bayan Baru-Bayan Lepas development corridor; and the Seberang Jaya-Bukit Mertajam, Butterworth-Bertam and Jawi-Nibong Tebal development corridors. These development corridors carry out activities among land with mix/different uses such as industrial, commercial and residential areas. The North-South Expressway has impacted the urban development of the region. This infrastructure promotes a linear urban growth pattern, where built-up areas begin to encroach into rural sites. This pattern of urban development creates a *desa-kota* region, where rural and urban areas coexist side by side with no clear defined boundary or a blurring of the rural and urban divide (McGee, 1989, 1990). New business and settlement centres have emerged between rural villages and paddy fields, namely Sungai Dua in Seberang Perai and Sungai Pinang in Balik Pulau.

47 The George Town conurbation also played an essential role in supporting the economic development and urbanization of the northern region of Malaysia. As peak of the urban hierarchy of the northern region, it serves other towns and states in the northern region in terms of economic, social, culture, education and other services. At the international level, Penang has established links and cooperation with other cities such as Adelaide, Australia in 1973; Medan, Indonesia in 1984; Xiamen, China in 1993; and Kanagawa Prefecture, Japan in 1991.

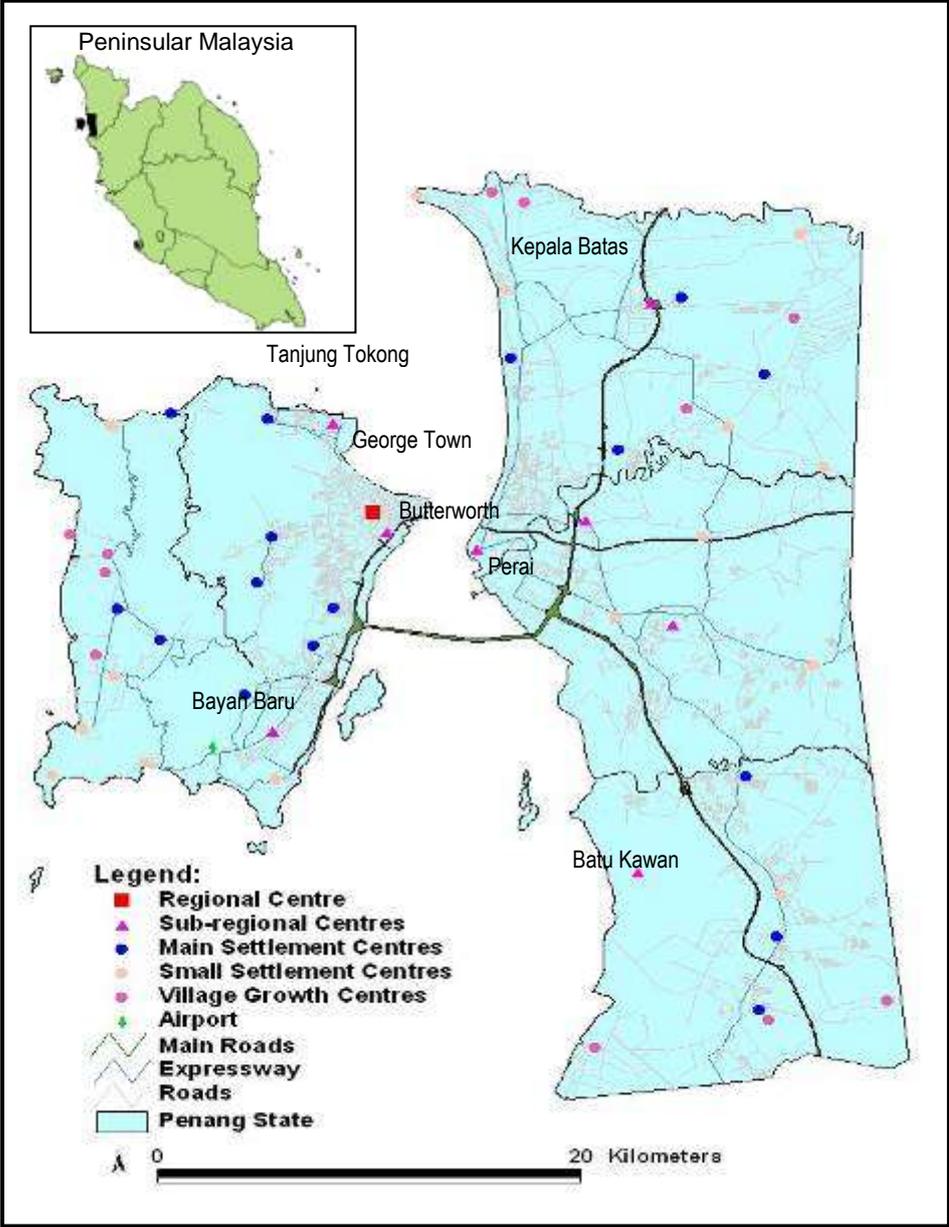
48 Recently, at the regional level, higher education institutions have also started to play an essential role in promoting urban growth in the Penang state. Universiti Sains Malaysia, the main campus which is located on Penang Island, helps to increase economic activities in the surrounding regions such as Sungai Dua and Gelugor. The engineering campus which is in the Seberang Perai Selatan district has become the impetus to economic development in Sri Ampangan and Nibong Tebal which together, is popularly known as the Trans-Krian region. The newly established Advance Medical and Dental Institute (AMDI) in Bertam, on the mainland (Seberang Perai Utara district), is slowly emerging as a catalyst that promotes economic and urban development in the region (Map 1.2).

49 Penang has experienced rapid population growth since the 1970s. This is mainly due to its urban and industrial developments that promote internal migration of adult population from other states to Penang. In 1970, the state population was only 776,124 and this increased to 900,772 in 1980 (Table 1.1). The annual growth rate was 1.50% between 1970 and 1980. The population continued to increase to 1,064,166 in 1991 with an annual growth rate of 1.53% between 1980 and 1991 (Department of Statistics, 1995). The Penang population increased quite significantly in nine years to 1,313,449 in 2000, representing a 2.37% annual growth rate between 1991 and 2000. In the following ten years (2000 to 2010), the Penang population has been estimated to increase at 3.05% annually to 1,773,442 in 2010 and at 2.89% annually to 2,357,982 by 2020 (Table 1.1). The recent population data gathered in 2005 indicated a population of 1,468,900 which shows an annual growth rate of 2.23% between 2000 and 2005. Population composition by ethnicity is shown in Table 1.2 and depicted in Figure 1.1 as well as Figure 1.2 of which indicate a more significant increase in the Malay population than the Chinese population between 1970 and 2010. Other categories such as the Indians and other races show no significant changes.

50 The Penang population is distributed unevenly among the five administrative districts. The most densely populated area is the Timur Laut district on Penang Island, of which metropolitan George Town covers 60% of the total area. In the mainland or generally referred to as Seberang Perai, the most urbanized district is the Seberang Perai Tengah district.

51 In year 2010, it is estimated that the total population ratio between Penang Island and the Seberang Perai mainland will be 60:40. This structure will change in year 2020 due to intense

development in Seberang Perai (evidenced by the rapid development in recent years). It is estimated that in 2020, the total population ratio between these two entities will be 40:60.



Map 1.2. George Town and its conurbation

Source: Department of Town and Country Planning (2009)

Table 1.1 Population growth of Penang, 1970–2020

Census Year	Population	Increase	Average Annual Population Growth Rate (%)
1970	776,124	-	-
1980	900,772	124,648	1.50
1991	1,064,166	163,394	1.53
2000	1,313,449	249,283	2.37
2010 (estimate)	1,773,442	459,993	3.05
2020 (estimate)	2,357,982	584,540	2.89

Source: Department of Statistics (1973, 1983, 1995, 2005); Department of Town and Country Planning (2009)

Table 1.2 Population growth of Penang by ethnicity, 1970–2010

	Total	Malay		Chinese		Indian		Other Bumiputera		Others		Non-Malaysian Citizen	
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
1970	776,124	237,253	30.57	436,745	56.27	89,673	11.56	-	-	12,453	1.60	-	-
1980	900,772	303,176	33.66	485,161	53.86	102,583	11.39	-	-	9,852	1.09	-	-
1991	1,064,166	405,348	38.09	523,211	49.17	112,830	10.60	1,146	0.11	5,770	0.54	15,861	1.49
2000	1,313,449	533,111	40.59	588,693	44.83	133,899	10.19	3,926	0.30	5,438	0.41	48,382	3.68
2005	1,468,900	600,300	40.87	631,800	43.01	147,200	10.02	5,200	0.35	6,100	0.42	78,300	5.33
2010 (estimate)	1,773,442	762,580	43.00	727,111.2	41.00	168,477	9.50	8,867	0.50	8,867	0.50	97,539	5.50

Source: Department of Statistics Malaysia (1973, 1983, 1995, 2001)

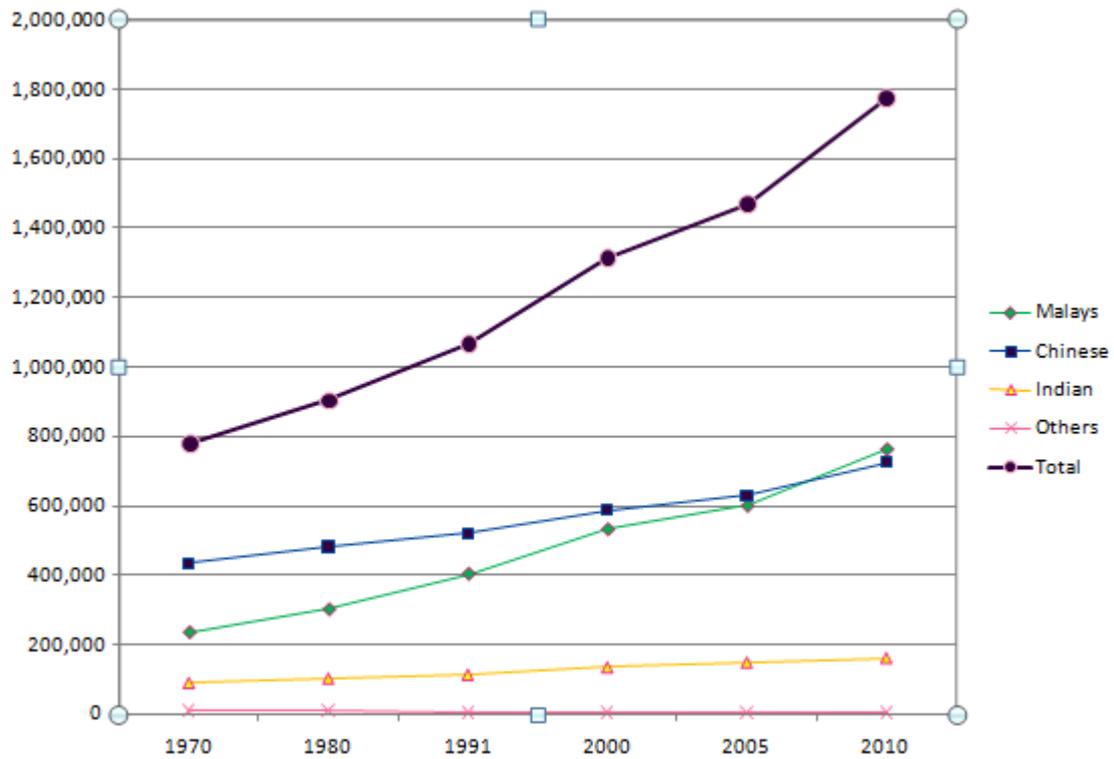


Figure 1.1. Total population by ethnicity, 1970-2010

Source: Department of Statistics (1973; 1983; 1995; 2000; 2005)

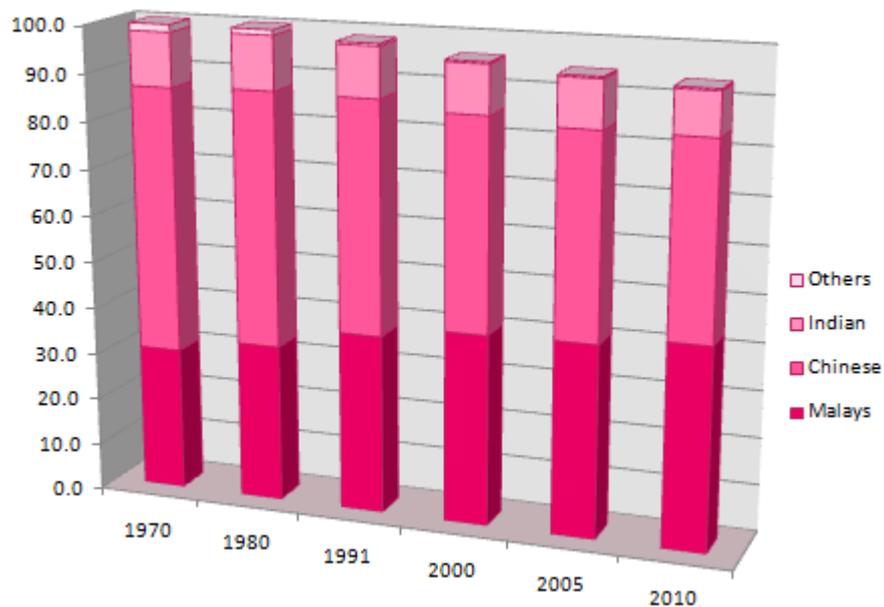


Figure 1.2. Population composition by ethnicity, 1970-2010

Source: Department of Statistics (1973; 1983; 1995; 2000; 2005)

1.1.1 Age Groups and Dependency Ratio

52 From year 1970 to 2000, the Penang state witnessed a steady decrease in the composition of young people of the age group of 0–14. In a 1970 census, this age group made up 41.10% of the total population. It decreased to 34.10% in 1980 and continued to decrease to 29.40% in 1991 and 26.90% in 2000. It is estimated that by 2010, this age group will represent a mere 26.30% of the Penang population. If this trend continues, it will have implications on higher education institution attainment in the next 30 years where the number of young people attending higher education institutions will also decrease.

53 The adult population of 15–64 years (working age group) however, showed an increase from 55.40% in 1970 to 61.70% in 2000. This working age group is estimated to stabilize at 68.40% in 2010 and plunge to 67.00% in 2020. The aging population (65 years and above), on the other hand, experienced a steady increase from 3.50% of the total population in 1970 to 4.20% in 1980, 4.80% in 1991 and 5.00% in 2000 (Table 1.3 and Figure 1.3). It is estimated that the aging population category in Penang will continue to increase to 5.30% in 2010 and 6.30% in 2020.

54 The population of the higher education age group (15–24) has also increased by 57% in the last 30 years. In 1970, the number of people in the 15–24 age group was 78,259. This increased to 95,377 in 1980, followed by 103,332 in 1991 and 122,852 in 2000. It is expected that this age group will continue to increase to 154,975 in 2020. Table 1.3 shows the dependency ratio and median age of the Penang population from 1970 to 2020. The dependency ratio for all populations decreased steadily from 80.50 in 1970 to 62.10 in 1980, 52.00 in 1991 and 46.80 in 2000. It is estimated to fall to 46.20 in 2010 but increase slightly to 49.20 in 2020. The median age, on the other hand, increased from 17.40 in 1970 to 19.60 in 1980, 21.90 in 1991 and 23.60 in 2000. It is estimated to increase to 27.40 in 2010 and 28.60 in 2020.

55 The increase in percentage of the adult and older populations in these 30 years underscores the fact that Penang has been experiencing significant improvement in general health and the well-being of the population. The decrease in percentage of the younger population, on the contrary, shows some decrease in the “value” of children among the adult population. Penang’s population trend is somewhat similar to those experienced by other developing regions in the world.

Table 1.3 Population growth, main age groups, dependency ratio and median age in Penang, 1970–2020

Year Census	Total	Average Annual Population Growth Rate (%)	Age Group			Dependency Ratio			Median Age
			0–14	15–64	65 & above	All	Young	Old	
1970	776,124		41.1	55.4	3.5	80.5	74.2	6.3	17.4
		1.50							
1980	900,772		34.1	61.7	4.2	62.1	55.3	6.8	19.6
		1.53							
1991	1,064,166		29.4	65.8	4.8	52.0	44.7	7.3	21.9
		2.37							
2000	1,313,449		26.9	68.1	5.0	46.8	30.5	7.3	23.6
		3.05							
2010 (estimate)	1,773,442		26.3	68.4	5.3	46.2	38.4	7.7	27.4
		2.89							
2020 (estimate)	2,357,982		26.7	67.0	6.3	49.2	39.8	9.4	28.6

Source: Department of Statistics (1973, 1983, 1995, 2000, 2005)

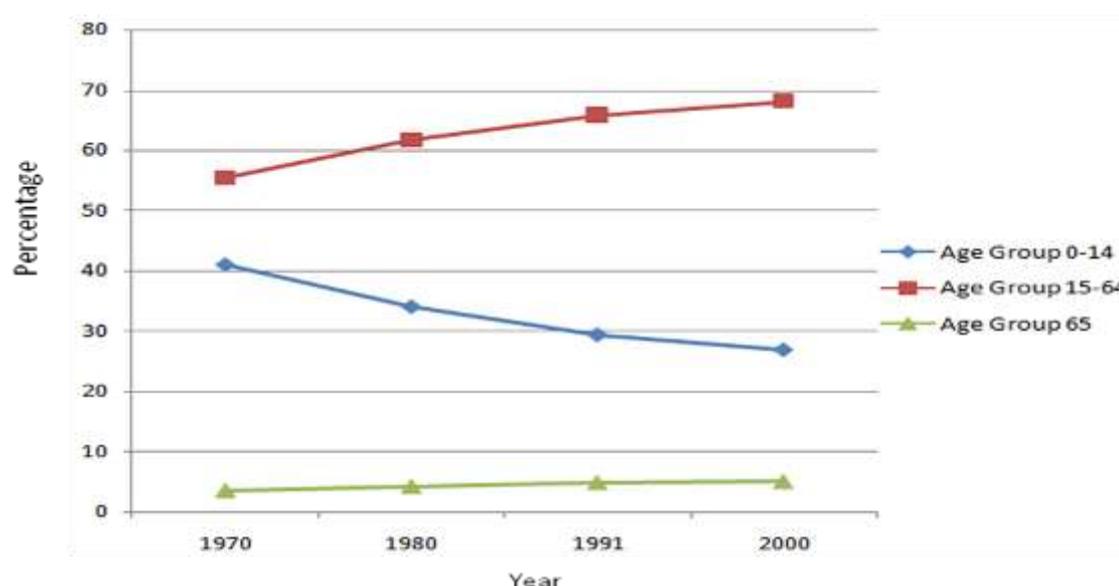


Figure 1.3. Population by age group, 1970–2000

Source: Department of Statistics (1973, 1983, 1995, 2000, 2005)

1.1.2 Ethnic Groups

56 Penang is a state with a predominantly Chinese population. In 1970, the Chinese made up 56.27% of the population. However, the percentage of Chinese population decreased to 53.86% in 1980, 49.17% in 1991 and 44.83% in 2000. In 2005, the Chinese represented 43.01% of the Penang population, with a 13.26% reduction in about 30 years. The Malays, on the other hand, comprised of 30.57% of the state population in 1970. The Malay population increased steadily to 33.66% in 1980, 38.09% in 1991 and 40.59% in 2000. In year 2005, the Malays comprised of 40.87% of the Penang population. The Indian population experienced a slight decrease in percentage from 11.56% in 1970 to 11.39% in 1980, 10.60% in 1991 and 10.19% in 2000. In 2005, the Indians comprised 10.02% of the Penang population.

1.2 The Demographic Situation

1.2.1 Key Demographic Indicators

57 Decline in the key economic indicator rates (crude birth and death rate, fertility rate and infant mortality) over the last 30 years shows improvement in the health status and well-being of the population. Other key demographic indicators are immigration and emigration, and the level of deprivation. These indicators have also changed over the last 30 years.

1.2.2 Crude Birth and Death Rate, Fertility, Infant Mortality and Life Expectancy

58 The Penang crude birth rate decreased from 29.30 per 1,000 population in 1970 to 19.90 per 1,000 population in 2000 and 16.30 per 1,000 population in 2004 (Department of Statistics, 2006). This shows a decline in crude birth rate of more than 35% over the last 30 years. The crude death rate, on the other hand, has decreased from 7.00 per 1,000 population in 1970 to 4.70 per 1,000 population in 2000, but increased slightly to 5.60 per 1,000 population in 2004. This represents a decline of about 30% over the last 30 years.

59 Total fertility rate meanwhile declined from 3.46 children per woman in 1970 to 1.83 children per woman in 2004, with about a 35% decline rate in 30 years. Today, the fertility rate in Penang has achieved a replacement level which is 1.80 children per woman. Replacement level fertility is the level of fertility of which a population exactly replaces itself from one generation to the next. In developed countries, replacement level fertility requires an average of 2.10 children per woman (Craig, 1994).

60 Another key indicator is infant mortality. In 1970, Penang's infant mortality rate was 38.00 per 1,000 live births. This number has decreased to 5.70 per 1,000 live births in 2000, showing a decline of 85% over the last 30 years. Neonatal mortality rate, on the other hand, declined from 26.90 per 1,000 live births in 1970 to 4.10 per 1,000 live births in the year 2000, with a decrease of 84.70% in 30 years. Life expectancy has also increased for both sexes. In 1991, for example, the life expectancy for male and female was 69.20 and 73.40 respectively. This increased to 71.50 and 76.20 respectively in 2005 (Department of Statistics, 2006). This suggests that the socio-economic condition, health and well-being of the population in the region have increased significantly in the last three decades. In addition to this, the Penang doctors and population ratio in 2000 was 1:963. The Penang state also recorded the lowest poverty rate in Malaysia in 2007, which was 0.02%.

1.2.3 Internal Migration

61 Penang experienced a net migration of 1,800 migrants for the five-year period between 1986 and 1991. The net migration increased to 13,600 migrants for the period 1995–2000 (Department of Statistics, 2000). In 2001–2002, the net migration was 8,400 migrants, and the figure further declined to 4,300 migrants in 2002–2003. Since 1990, Penang’s net migration has always been positive, indicating that Penang has attracted migrants from other states in Malaysia.

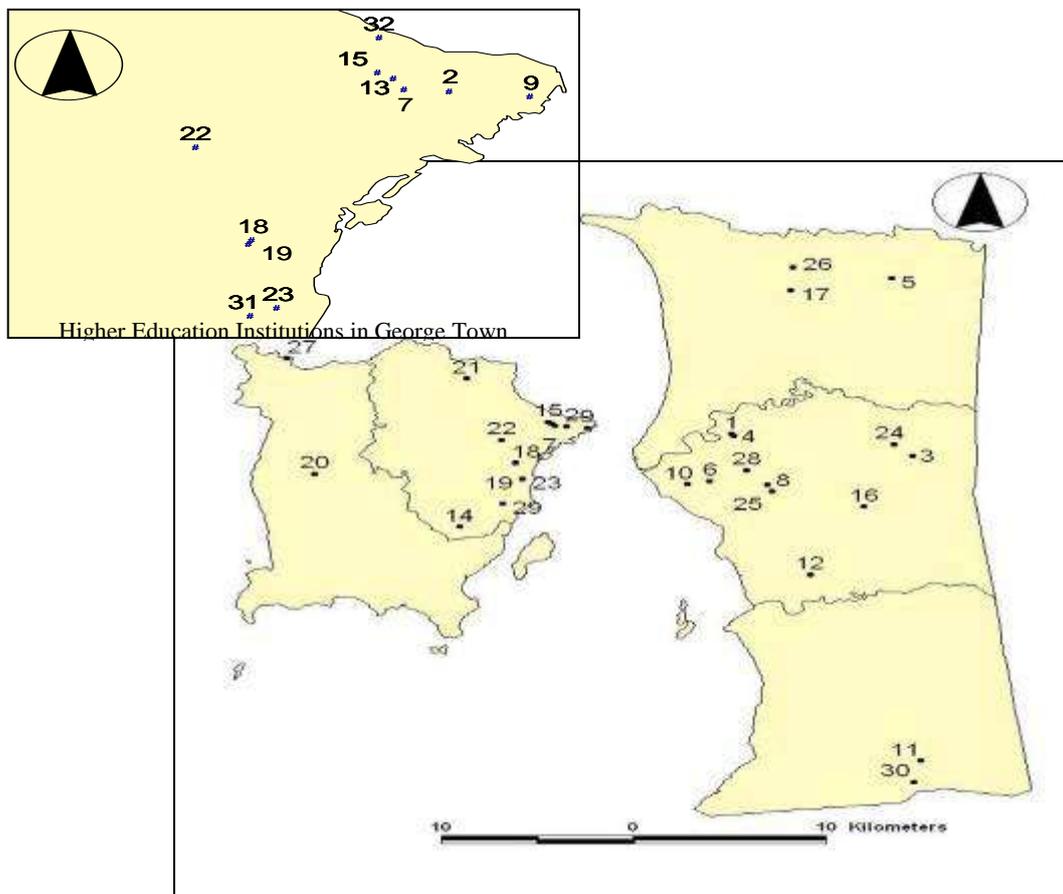
1.2.4 Levels of Education

62 Table 1.4 shows the level of education attainment in Penang in the year 2000. From Table 1.4, only 8.90% of the total population achieved tertiary level education and of this, 49,341 were males and 43,817 were females. Within the region, tertiary students are mainly enrolled in Universiti Sains Malaysia, Universiti Teknologi MARA (UiTM) Penang and several private colleges which are mostly feeder colleges to higher education institutions located in Klang Valley.

Table 1.4 Level of education attainment for Penang, 2000

	Total	Percent	Male	Percent	Female	Percent
Total population	1,041,622		526,988		514,634	
Pre-school	26,553	2.50	13,689	2.60	12,864	2.50
Primary school	318,334	30.60	155,351	29.50	162,983	31.70
Lower secondary school	249,289	23.90	134,051	25.40	115,238	22.40
Upper secondary school	287,551	27.70	140,142	26.60	147,409	28.60
Vocational/technical education	10,336	1.00	6,346	1.20	3,990	0.80
Trade and technical skills institution	5,495	0.50	3,796	0.70	1,699	0.30
Post secondary education	31,447	3.00	14,051	2.70	17,396	3.40
Tertiary education	93,158	8.90	49,341	9.40	43,817	8.50
Unknown	19,459	1.90	10,221	1.90	9,238	1.80

Source: Department of Statistics (2000)



Legend			
NO.	INSTITUTIONS	NO.	INSTITUTIONS
1	MARA TRAINING CENTRE (PUSAT GIAT MARA)	17	KEPALA BATAS COMMUNITY COLLEGE
2	COSMOPOINT COLLEGE	18	PENANG METHODIST COLLEGE
3	INSTITUT KEMAHIRAN BELIA NEGARA	19	OLYMPIA COLLEGE
4	INSTITUT BINA PULAU PINANG	20	ISLAND COLLEGE OF TECHNOLOGY
5	INDUSTRIAL TRAINING INSTITUTE	21	TUNKU ABDUL RAHMAN COLLEGE
6	NURI TECHNOLOGY INSTITUTE	22	MAKTAB PENGAJIAN AL-QURAN
7	SENTRAL TEHNOLOGY COLLEGE PENANG	23	FEDERAL TEACHERS TRAINING COLLEGE
8	INSTITUT YAYASAN BUMIPUTRA PULAU PINANG	24	TUANKU BAINUN TEACHERS TRAINING COLLEGE
9	TECHNOLOGY AND MANAGEMENT INSTITUTE (ITP)	25	SEBERANG PERAI POLYTECHNIC
10	TUN ABDULK RAZAK TECHNOLOGY INSTITUTE (ITTAR)	26	MARA TRAINING CENTRE (PUSAT GIAT MARA)
11	INDUSTRIAL TRAINING INSTITUTE	27	SAMUDERA RESEARCH CENTRE, UNIVERSITI SAINS MALAYSIA
12	JAPAN MALAYSIA TECHNICAL INSTITUTE (JMTI)	28	UNIVERSITI TEKNOLOGI MARA (UITM)
13	INFORMATICS COLLEGE	29	UNIVERSITI SAINS MALAYSIA
14	INTI INTERNATIONAL COLLEGE PENANG	30	ENGINEERING CAMPUS, UNIVERSITI SAINS MALAYSIA
15	KOLEJ DAMANSARA UTAMA (KDU)	31	REGIONAL CENTRE FOR EDUCATION IN SCIENCE AND MATHEMATICS (RECSAM)
16	COMMUNITY COLLEGE	32	WAWASAN OPEN UNIVERSITY (WOU)

Map 1.3. Higher education institutions in the Penang region

Source: Department of Town and Country Planning (2008)

1.3 The Economic and Social Base

1.3.1 The Economic Base of the Region

63 The nation's structural economic transformation started after Malaya's independence in 1957 with specific transformation policies and programmes instituted beginning in the 1960s. The transformation started with the import substitution industrialisation (ISI) policies introduced in the 1960s and later with export-oriented strategies in the 1970s and 1980s. Industry and trade have always been the engines of growth for the development of Penang. The agricultural sector has remained consistently small relative to the other economic sectors. With the introduction of the ISI policies in the 1970s, the industrialisation process in Penang was further intensified. Starting with an initial seven multi-national corporations (MNC) at the Free Trade Zone (FTZ) areas in 1972 (now known as Free Industrial Zones (FIZ)), Penang now has additional two FIZs and five industrial parks with 64 MNCs. The industrialisation focus has shifted from simple electrical and electronic (E&E) products to high value-added products such as disk drives, and computer parts and components; to communication and consumer electronic products; and also to products of higher technological levels. In line with the nation's goal to become a knowledge-based economy, Penang has slowly started to shift in this direction. Figure 1.4 shows the time line of Penang's economic transformation.

64 The industrialisation policy has also opened up many opportunities for small and medium enterprises (SME) in Penang which complement the establishments of MNCs. At present, the total number of small and medium industries (SMI) registered with SMIDEC is 740 establishments. During the 1997/98 financial crisis, the Malaysian Ringgit depreciated and this affected Malaysia, in particular, globally-exposed state economies such as that of Penang.

65 Penang's significance as an industrialised state has led it to become the growth centre for the northern region and leader in manufacturing activities. Hence, the relative importance of the agriculture sector declined. Since then, Penang has been nicknamed, the 'Silicon Valley' of the East in the 1990s, referring to its very important role in the E&E industry. Under the nation's corridor development programme, Penang became part of the Northern Corridor Economic Region (NCER) along with the states of Kedah, Perlis and northern Perak.

Before Independence (before September 1957)	After Independence (September 1957–1970)	New Economic Policy Era (1971–1990)	National Development Policy Era (1991–2000)	National Vision Policy Era (2001–2010)
<p style="text-align: center;">←————→</p> <p>Entrepot trade and agriculture (mainly in Seberang Perai)</p> <ul style="list-style-type: none"> - entreport trade led to well-developed infrastructure, communication and basic services 	<p>Industrialisation strategy programme implemented</p> <ul style="list-style-type: none"> - introduction of the Free Trade Zone Area (1969) - development of seven MNCs in 1972 in electronics (semiconductors) 	<p style="text-align: center;">←————→</p> <p>Intensified industrialization programme</p> <ul style="list-style-type: none"> - Focus shifted from simple E&E components to high value-added components such as disk drives, and computer parts and components; to communication and consumer electronics products; and also to products of higher technological levels such as precision metal parts, and automated equipment and 		
		<p>Intensive industrial and technological transformation</p> <ul style="list-style-type: none"> - emphasised on: <ul style="list-style-type: none"> • technical intensive processes • skill intensive processes • capital intensive processes 	<p>Knowledge-based industry</p> <ul style="list-style-type: none"> - emphasised on human capital intensive activities engaging in research and development (R&D) to produce higher value-added products and services 	

Figure 1.4. Time line of Penang’s economic transformation (1957–2010)

Source: Authors based on group deliberation

66 Penang has shown good economic achievements relative to the country’s accomplishments in the last several years. The growth rate of Penang at 8.00% for the period 1980–1989 exceeded that of the nation by 3.90% and as shown in Table 1.5, the gross domestic product (GDP) growth rate of 11.41% exceeded that of the nation by 1.91% for the period of 1991–1995. For the period of 1996–2000, Penang’s growth rate was 4.97% and was 0.37% higher than that of the nation. For the period of 2001–2005, Penang’s growth rate performance was better at 6.90%. This was 2.40% higher than that of the nation. Penang’s growth rate for the period 2006–2010 was forecasted to be 7.30%. The major contributors of this relatively higher growth rate are the manufacturing, E&E and services sector such as utilities, telecommunication, tourism, etc.

Table 1.5 Gross domestic product (GDP) growth rates (%)

	1991-1995		1996-2000		2001-2005		2006-2010 ^f	
	Malaysia	Penang	Malaysia	Penang	Malaysia	Penang	Malaysia	Penang
GDP at Market Prices	9.50	11.41	4.60	4.97	4.50	6.90	6.00	7.30
GDP per capita	9.21	9.80	4.03	3.90	4.99	5.90	6.70	6.20

^f forecast

Source: SERI, Rancangan Negeri Pulau Pinang Pertama, Penang State (2001–2005); Department of Statistics (various years)

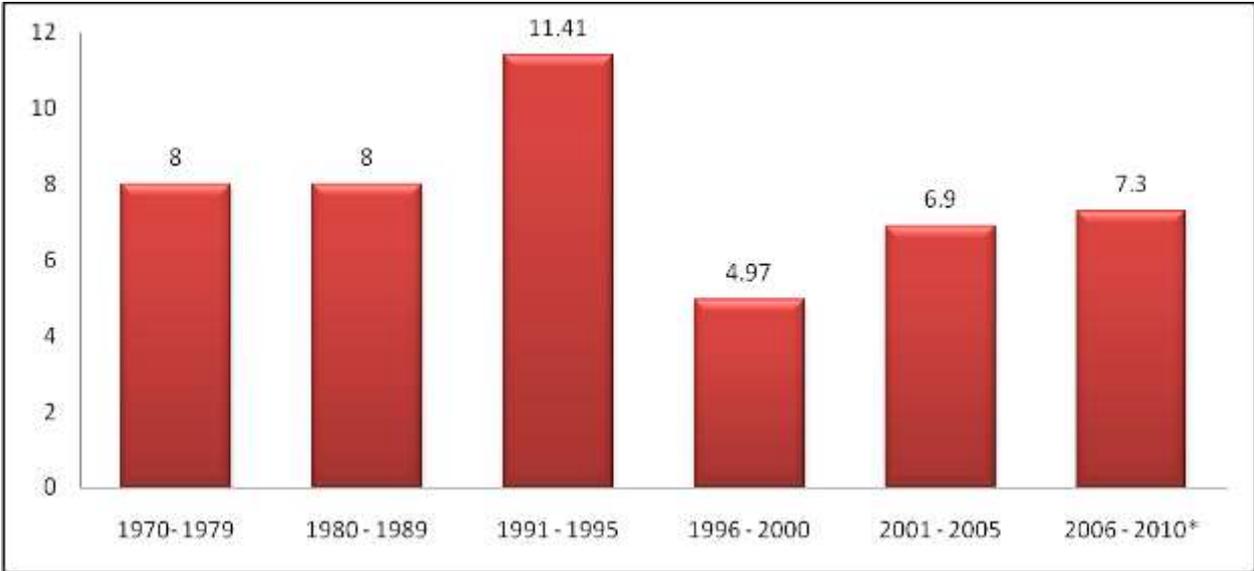


Figure 1.5. Gross domestic product (GDP) growth rates (%) for Penang, 1970–2010

* forecast

Source: SERI, Rancangan Negeri Pulau Pinang Pertama, Penang State (2001–2005); Department of Statistics (various years); Koh (1997)

67 Table 1.6 shows Penang's employed population in 2000. The three major employment sectors were manufacturing at 42.30%, wholesale and retail trade at 11.10%, and hotel and restaurant at 6.40%. In the manufacturing sector, employment breakdown according to gender was female at 51.10% and male at 36.90%. Notably, more males (13.00%) participated in wholesale and retail trade compared to females (7.90%). In the hotel and restaurant sector, the percentage of males involved in this sector was also noticeably more at 7.10% compared to females at 5.20%.

Table 1.6 Employed population (ages 15–64) in year 2000

Employed population	Total		Male		Female	
	519117		322702		196415	
	Total	Percentage	Total	Percentage	Total	Percentage
1. Agriculture, hunting and forestry	5301	1.00	4740	1.50	561	0.30
2. Fishing	2178	0.40	2137	0.70	41	0.10
3. Mining and quarrying	574	0.10	474	0.10	100	0.10
4. Manufacturing	219595	42.30	119239	36.90	100356	51.10
5. Electricity, gas and water supply	3303	0.60	2979	0.90	324	0.20
6. Construction	19309	3.70	17838	5.50	1471	0.70
7. Wholesale and retail trade	57441	11.10	41851	13.00	15590	7.90
8. Hotel and restaurant	33368	6.40	23054	7.10	10314	5.20
9. Transport, storage and communication	25704	4.90	22047	6.80	3657	1.90
10. Finance	14534	2.80	7682	2.40	6852	3.50
11. Real estate, renting and business activities	11087	2.10	6863	2.10	4224	2.10
12. Public administration and defence	28516	5.50	23398	7.20	5118	2.60
13. Education	26666	5.10	10484	3.20	16182	8.20
14. Health and social works	12560	2.40	4386	1.30	8179	4.20
15. Other community, social and personnel services activities	7892	1.50	4412	1.40	3480	1.80
16. Private household with employed persons	4492	0.90	145	0.04	4347	2.20
17. Extra territorial organisations and bodies	24	0.003	10	0.003	14	0.007
18. Unknown	46573	9.00	30996	9.60	15605	7.90

Source: Department of Statistics (2000)

Table 1.7 Sectoral share of gross domestic product (GDP) (%)

	1995	2000	2001	2002	2003 ^e	2004 ^f
Agriculture, forestry and fishing	1.60	1.30	1.60	1.60	1.60	1.60
Mining and quarrying	1.20	1.10	1.20	1.10	1.00	0.90
Manufacturing	43.90	45.70	41.30	41.30	41.30	42.30
Construction	3.30	2.40	2.40	2.10	2.10	2.00
Services	50.00	49.50	53.50	53.80	54.00	53.20

^e estimate, ^f forecast

Source: SERI (2008)

68 Table 1.7 shows the sectoral share of GDP for the period 1995–2004. Manufacturing and the tertiary sector took up more than 90% of the share of GDP. Penang has always been ahead of the other states in manufacturing given that it is the hub for the manufacturing of E&E products in designated industrial estates and it is where the FTZs (now FIZs) are set up by the government. The first FTZ in Malaysia was established in Penang in 1972. The agricultural sector which was the main engine of growth prior to 1957 has remained relatively small although rice and other agricultural food are also grown in the Penang state. Rice (paddy) occupies about 25% of the 46,778 hectares (ha) of agriculture land in 2007. Rubber and oil palm are still the main cash crops for the state occupying about 52% of the total agriculture land. There are other agricultural activities in the state: fruits (6,747 ha), vegetables (410 ha), coconut (2,037 ha), cocoa (9 ha), cash crops (217 ha), spice (210 ha) and others (24 ha). Table 1.8 shows the agriculture land used by crops (in hectares) in 2001–2007. These figures illustrate that Penang's agriculture land has decreased in recent years — especially those near existing urban centres — mainly due to urbanization.

Table 1.8 Agriculture land (in hectares) used by crops, 2001–2007

Year	2001	2002	2003	2004	2005	2006	2007
Type							
Paddy	13,448	13,448	13,448	12,782	12,782	12,782	12,782
Fruits	6,830	6,760	6,802	6,872	6,668	6,812	6,747
Rubber	12,758	12,758	12,758	11,765	11,177	11,177	10,838
Oil Palm	14,821	13,725	14,329	13,868	14,074	13,962	13,504
Vegetables	458	423	404	460	481	410	410
Coconut	2,339	2,309	2,313	2,176	2,119	2,195	2,037
Cocoa	104	75	75	61	58	10	9
Cash Crops	247	190	242	309	235	269	217
Spice	190	196	148	163	169	167	210
Others	74	55	21	58	56	50	24
Total	44,439	49,939	50,540	48,514	47,819	47,834	46,778

Source: SERI (2008)

69 The unemployment rate in Penang is low compared to that of the nation as indicated in Figure 1.6 below. The unemployment rate in Penang ranged from the lowest at 0.7 0% in 1996 to the highest at 2.40% in 2001. For the same period, the unemployment rate of the females (1.56%) was lower than that of the males (1.80%). Nevertheless, during the 1997 Asian financial crisis, the unemployment rate of women (1.40%) was higher than that of the men at 0.90%.

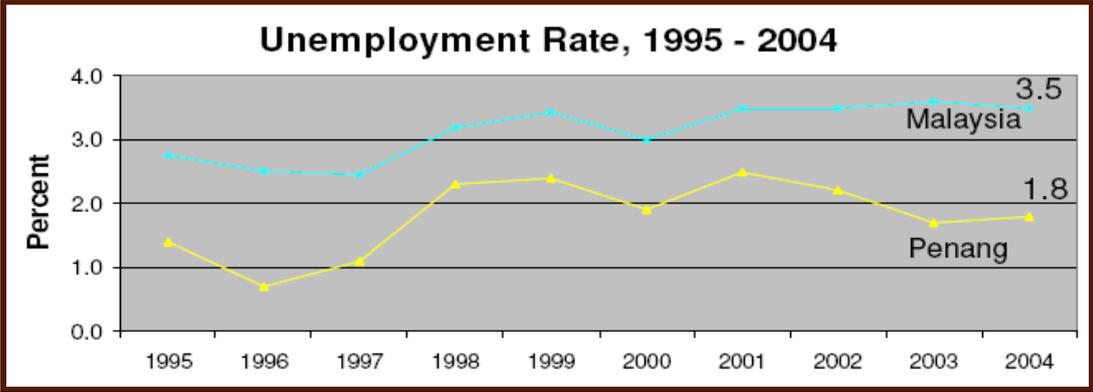


Figure 1.6. Unemployment rate in Penang and Malaysia, 1995–2004

Source: Department of Statistics (compiled by authors)

70 The manufacturing sector is the biggest employer at about 36% of Penang’s total labour force in 2007. The agriculture sector, on the other hand, could only absorb less than 2% of the total labour force. The rest of the labour force is in the services sector and is particularly high in the wholesale and retail trade at about 15%. Other significant employers in the services sector are hotel and restaurants (8.40%); transport, storage and communication (5.80%); public administration and defense, and compulsory social security (4.80%); and education (4.60%). Other major employment sectors are health and social work (3.50%); other community, social and personal services (3.00%); private household with employed persons (2.80%); financial intermediation (2.20%); and electricity, gas and water supply (0.50%).

71 Although efforts are being intensified on developing human capital in the state by a move towards a more knowledge-based economy, expenditure on R&D is still considered very low. Nationally, it is only about 1% of the GDP in 2005. This figure compared to the percentage spent in 2000 at 0.50% however, proves to be rather impressive. The private sector leads in R&D expenditure in 2005 at RM2.8 billion as compared to the public sector which only spent RM1.5 billion.

72 Data for the consumer price index (CPI) is only available at the national level. The CPI has increased at least 10% since 2005. The highest increase is in alcoholic beverages and tobacco at 30%, mainly due to higher duty imposed on these goods by the government. Clothing and footwear, and communications, on the other hand, registered a decrease in CPI over the same period at – 4.00% and - 3.50% respectively. Looking at the inflation rate since 1971, data recorded has been quite impressive. While the rate for the period of 1971–1980 was 6.00%, it has since decreased to 3.20% for the 1981–1990 period, 3.60% for 1991–2000 and 1.87% for years 2001–2005.

1.3.2 The Social Base of the Region

73 Penang has undergone various stages of development from an agricultural to an industrial-based society. Industrialisation has impacted society’s composition structurally and socially. Although Penang is experiencing major social transformation changes, social problems faced by the state are still relatively few. Penang for example has a low poverty incidence rate which is 0.30%, while the hardcore

poverty incidence rate is less than 0.05% (9th Malaysian Plan). In terms of cases of intravenous drug users (IDU) with HIV/AIDS, the state of Penang was once rated second highest in Malaysia but recently, the rate has dropped as compared to other states. Even though Penang is relatively small in size, it has one of the highest rates of migration in the nation. In fact, Penang has been experiencing a positive net migration since 1990, primarily due to its manufacturing development. This has attracted many migrants to Penang.

74 The cultural diversity of Penang mirrors its multi-ethnic demography with each ethnic group further divided into different languages, customs, belief systems and origins. Its vibrant economy adds an international element to the diversity as the state is home to expatriates from countries such as Britain, Japan and South Korea as well as to low-waged workers from nations such as Bangladesh, Indonesia and Myanmar. Most of the expatriates work in the manufacturing industry either in Penang or in the nearby state of Kedah.

75 “Malaysia My Second Home Program” brings in retirees from Japan and South Korea while the education sector attracts foreign students from places such as China, the Middle East and Indonesia. In addition to being well known for its diversity, George Town was recognised by UNESCO as a Heritage City due to its unique buildings and townscape which reflect its diversity as well as its long and rich history.

76 In the last 40 years, Universiti Sains Malaysia, as one of the leading higher learning institutions in the country, has played major roles in reshaping Penang. By using the transdisciplinary approach, Universiti Sains Malaysia has contributed many researches in various themes and areas. In the fields of pure, applied and social sciences, humanities and education, the university has helped to reshape the community in coming up with research that can be used for the benefit of society. In addition, the establishment of specific units and centres to cater to various research areas has also contributed to the significant role of Universiti Sains Malaysia in reshaping Penang as a community. Some of the significant centres established under Universiti Sains Malaysia include the Centre for Policy Research and International Studies (CenPRIS), Research and Education for Peace Unit (PEACE), AIDS Action Research Group (AARG), Centre for Islamic Development Management (ISDEV), Women’s Development Research Centre (KANITA), Water Watch Penang (WWP), Centre for Drug Research, National Poison Centre and many others. The establishment of these centres and their activities have contributed significantly to alleviating social problems in the city region. In addition, they have also contributed to capacity building for specific target populations in the city region.

77 Universiti Sains Malaysia plays an important role as “social developer” in Penang. Besides teaching, many of its lecturers, in collaboration with individuals and groups within the local community, are also actively involved in the establishment of various non-governmental organisations (NGO) that help to unravel social issues and alleviate social problems.

78 Social networking with the government and various NGOs, which is very crucial in community engagement, has also enabled Universiti Sains Malaysia to contribute to the development of specific communities in Penang. Activities such as research collaborations and student internships with various industries in Penang indirectly positions Universiti Sains Malaysia as an important “social broker” in the development of Penang.

79 Universiti Sains Malaysia aspires to continue to provide educational opportunities for various target groups such as senior citizens, the physically challenged and school dropouts to further enhance their personal development, which in the longer term will expand the human capital base and improve capacity in the state.

1.4 Governance Structure

80 The Malaysian government is run based on a federal framework. This refers to the three-tier government structure, namely, federal, state and local. While one of the strength of federalism is that

diffusion of power to the regional or local government is guaranteed under the constitution, a close scrutiny of the Malaysian Constitution reveals that federalism as practiced in Malaysia has an inbuilt federal bias whereby all effective powers rest with the federal government. The more substantive provisions under the “state list” include land, logging, water and mining (Table 1.9). In other words, state governments in Malaysia have limited capacity to carry out development projects which further undermines their independence from the federal government.

81 The federal government has also established a number of national councils to assist and coordinate programmes. These national councils include the National Economic Council, National Security Council, National Local Government Council, National Land Council and National Finance Council.

82 Although many state governments are headed by rulers, as a practice, the ruler acts on the advice of the Chief Minister who is the chairman of the State Executive Council. However, Penang, being a former British settlement, is a state without a hereditary state ruler. Therefore, a governor is appointed by the constitutional king as the Head of State.

83 Penang’s local government comprises of local authorities who are normally referred to as municipalities and district councils. Another level is the district administration, the functional body for the state and federal government at the district level who coordinates development activities through different types of committees.

84 In the matters of economic and social development, the state government has autonomy to decide and implement all policies and programmes that they deem necessary for the development of the state. However, the extent of its autonomy is determined by the federal government through various policies and regulations. The local authorities (municipalities and district councils) have a certain degree of discretionary power on local development issues but they are subordinate to the state government. The municipalities have to submit their local plans to the state government for approval. In the context of Penang, the state government is assisted by the State Secretariat and State Economic Planning Unit as well as other departments in planning and implementing its socio-economic development programmes.

Table 1.9 constitutional divisions of powers between the federal and state government

Federal List	State List	Concurrent List
External affairs	Islamic affairs	Social welfare
Defense and security	Land ownership and use	Public health
Trade, commerce and industry	Agriculture and forestry	Town and country planning
Shipping, communication and transport	State works and water supply	Drainage and irrigation
Water supply, rivers and canals	Malay reservation and custom	Rehabilitation of mining land and soil erosion
Finance and taxation	Local government	National parks and wildlife
Education and health		Labor and social security
Public works and utilities		

Source: Compiled by authors based on Malaysian Federal Constitution

85 Under the Malaysian Torrens System, land is a state government's matter by virtue of Article 74(2) of the Federal Constitution. The state government's statutory power is also vested in the National Land Code 1965. Furthermore, the Land Acquisition Act 1960 (amended) provides that the state authority can acquire any land needed:

- i) for any public purpose;
- ii) by any person or corporation for any purpose which in the opinion of the state authority is beneficial to the economic development of Malaysia or any part thereof, or to the public generally or any class of the public; or
- iii) for the purpose of mining or for residential, agricultural, commercial, industrial or recreational purposes or any combination of such purposes.

86 The state government established the Penang Development Corporation (PDC) as its development agency to plan and develop projects for socio-economic development in the state. Among the main responsibilities of PDC are to identify potential land to be developed as its projects, undertake study to increase its land bank, manage and administer its land and property development.

87 The Penang state government has also established an investment entity called InvestPenang with a primary focus to sustain, rejuvenate and further promote business ventures in the state. InvestPenang supports investors by networking with government agencies at the federal, state and local level. These agencies include:

- i) Penang Development Corporation (PDC)
- ii) Municipal Council of Penang Island (MPPP) and Municipal Council of Seberang Perai (MPSP)
- iii) Ministry of International Trade and Industry (MITI)
- iv) Malaysian Industrial Development Authority (MIDA)
- v) Small and Medium Industries Development Corporation (SMIDEC)

vi) Multimedia Development Corporation (MDeC)

vii) Malaysian Biotechnology Corporation (BiotechCorp)

viii) Malaysia External Trade Development Corporation (MATRADE)

88 In Malaysia, tax incentives, both direct and indirect, are provided for in various federal legislations, namely, the Promotion of Investments Act 1986, Income Tax Act 1967, Customs Act 1967, Sales Tax Act 1972 and Excise Tax Act 1976. These Acts cover investments in the manufacturing, agricultural, tourism and approved services sector as well as R&D, training and environmental protection activities. The direct tax incentives grant partial or total relief from income tax payment for a limited period, while indirect tax incentives come in the form of exemptions from import duty, sales tax and excise duty. Applications to qualify for these incentives are administered by the Malaysian Industrial Development Authority (MIDA) under the purview of the Ministry of International Trade and Industry (MITI). The state government, with the cooperation of the municipalities, provides infrastructural facilities and services to promote business investments such as allocating land for the FTZs, upgrading transport and telecommunication facilities as well as recruiting a vibrant and innovative workforce.

89 The industrial sector in Penang requires an adequately trained workforce with various technical and vocational skills. In response to this need, the state government has set up several training institutions such as the Penang Skills Development Centre (PSDC), Japan Malaysia Technical Institute (JMTI), Tunku Abdul Rahman College (TARC), Institut Perguruan Tun Abdul Razak (IPTTAR), MARA Training Center (Pusat Giat MARA) and polytechnics. The federal government has also given approval of the budget allocation to set up more skills development institutes (institut latihan kemahiran) to provide training for school leavers. Two industrial training institutes were built in Seberang Perai along with other training institutes set up by the Majlis Amanah Rakyat (MARA) (a federal government agency) such as Pusat Giat MARA, Institut Kemahiran MARA, Kolej Tinggi Kemahiran MARA and Institut Kemahiran Belia Negeri. In addition, the state government also embarked on a joint-venture effort with Penang Regional Development Authority (PERDA) (a federal government agency) in providing technical and vocational training programmes catered for youths and school leavers.

90 PSDC was established in 1989 and today, has become one of the best industry-led model skills training centre in the country. Its reputation is recognised both regionally and internationally. The provision for vocational education is largely the federal government's responsibility especially in terms of policies, curriculum, financing and regulations. Among the federal government agencies involved in vocational education are the Ministry of Education, Ministry of Human Resources, Ministry of Agriculture, and Ministry of Youth and Sports. Meanwhile, the state government normally set up skills development centres (pusat latihan kemahiran) to provide basic training programmes for the youths in their respective staff.

1.5 Emerging Issues

91 The issues and challenges of Penang with respect to its economy, population and social conditions are as follow:

- i) Limited state land for future development poses serious development problems as acquiring private land is not only expensive but also slow. Future developments will have to be more capital intensive and require little land.

- ii) Significant increase in the adult population, ages 15–64 (the working age group), from year 1970–2010, shows the crucial importance of job creation in Penang. Higher value-added activities will attract more skilled workers due to the higher wages.
- iii) SMEs appear to not have fully utilised their potential. A more concerted effort by the relevant agencies is needed to help SMEs have better access to opportunities and better develop their products and services to be more competitive.
- iv) With Penang's fertility rate now below replacement level, and as the elderly population increases, future planning efforts must include the special needs of this population.
- v) There is an increasing trend of people living with HIV/AIDS, particularly among women and children. The spread of HIV/AIDS is not solely due to sexual promiscuity but also due to intravenous drug users. It is therefore crucial to train more social workers and counselors who can help improve the social well-being of the targeted population more effectively.

CHAPTER II: CHARACTERISTICS OF THE HIGHER EDUCATION SYSTEM²

Introduction

92 With encouraging progress in the Malaysian economy, there has been a steady demand for higher educational standards and quality. As of 2010, the Malaysian higher education system comprises 20 public universities, 32 private universities and university colleges including four foreign university branch campuses, and no less than 450 private education institutions. The private sector, playing an important role in the development of transnational higher education in the English speaking world, pioneered twinning from the late 1980s and the 3+0 model from 1997 where a student may take an entire undergraduate degree from a foreign university in Malaysia to prevent many Malaysians from studying abroad (OBHE, 2004). The Malaysian higher education system is characterized by highly diversified education providers and modes of programme delivery.

2.1 Profile of Higher Education System and Student Enrolments

93 Student enrolment in higher education institutions in the year 2007 was 847,485 students, an increase of 214,941 students from 2002. Of these, 382,997 students were in public universities, whereas, 365,800 students were from private institutions. Table 2.1 provides the profile of student enrolment and output in Malaysian higher education institutions between 2002 and 2008 (July), highlighting the important contribution of the various types of institutions including polytechnics and community colleges. Similar statistics are presented graphically in Figures 2.1 to 2.4, whereby increasing trends in student enrolment and output are clearly depicted. Arguably, except for the private sector, all other categories of education providers have been experiencing a steady growth in student enrolment and output. This is clearly shown in the case of student enrolment and output among colleges and polytechnics (Figure 2.3). Noticeably, a marked dip in student enrolment and output among private providers in 2005 resulted in a slight decrease in the overall student enrolment and output in the system. This situation indicates the important contribution of private providers to the higher education system.

Table 2.1 Student enrolment and output in higher education institutions in Malaysia, 2002–2008

Type of Institution	Year	2002	2003	2004	2005	2006	2007	2008
Public HEIs	Enrolment	281,839	294,359	293,978	307,121	331,025	382,997	403,009
	Output	57,435	75,842	71,924	79,934	81,095	85,448	56,317
Private HEIs	Enrolment	294,600	314,344	322,891	258,825	323,787	365,800	419,778
	Output	139,150	137,018	134,987	57,953	83,186	83,431	51,571
Colleges/ Polytechnics/ Community colleges	Enrolment	56,105	59,916	73,327	83,707	93,318	98,688	102,429
	Output	18,774	20,714	21,441	28,555	31,870	34,451	35,873
Total	Enrolment	632,544	668,619	690,196	649,653	748,130	847,485	925,216
	Output	215,359	233,574	228,352	166,442	196,151	203,330	143,761

*figures for 2008 are up to July 2008

Source: MOHE (2008)

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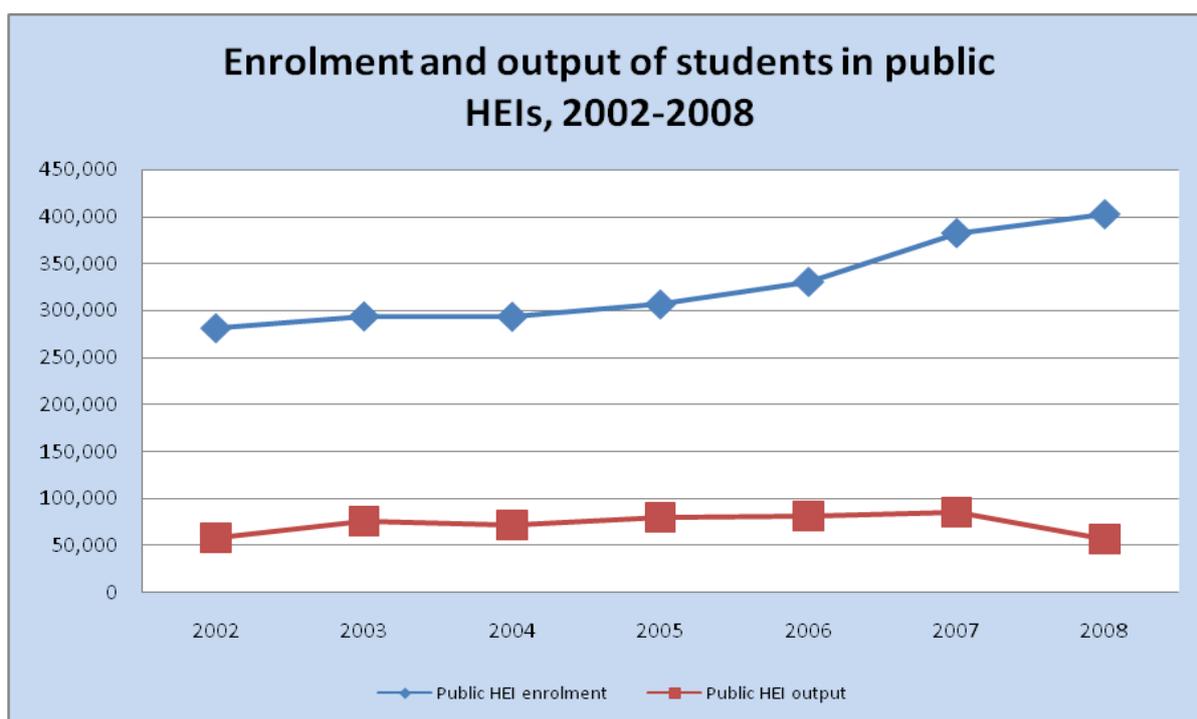


Figure 2.1. Enrolment and output of students in public higher education institutions, 2002–2008

Source: MOHE (2008)

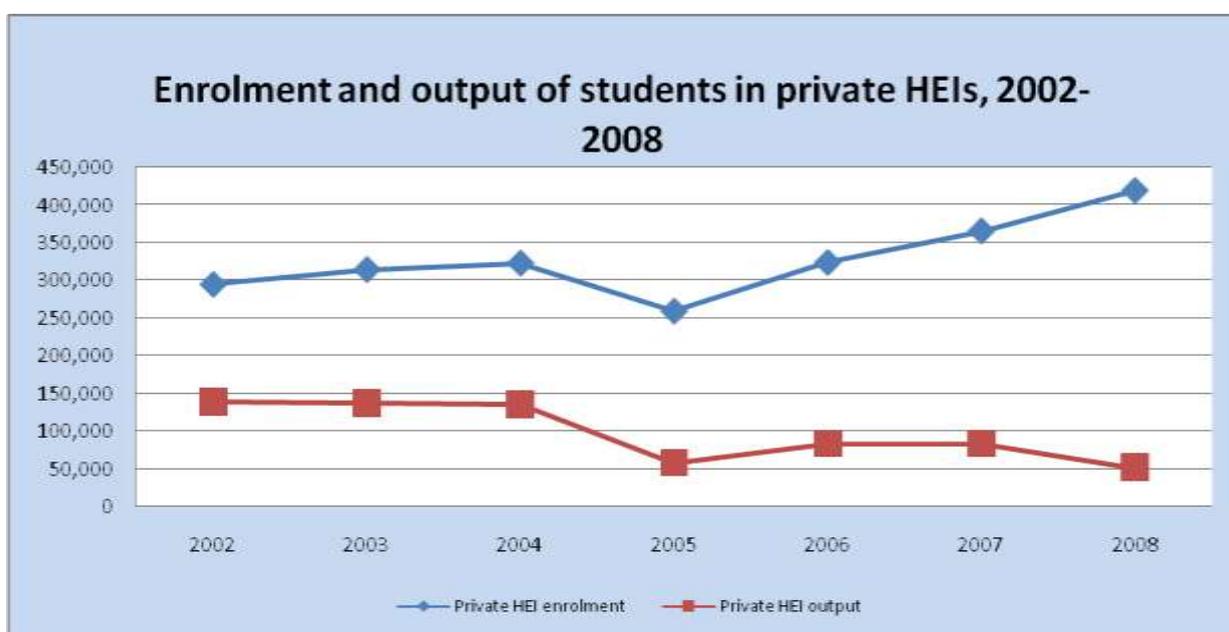


Figure 2.2. Enrolment and output of students in private higher education institutions, 2002–2008

Source: MOHE (2008)

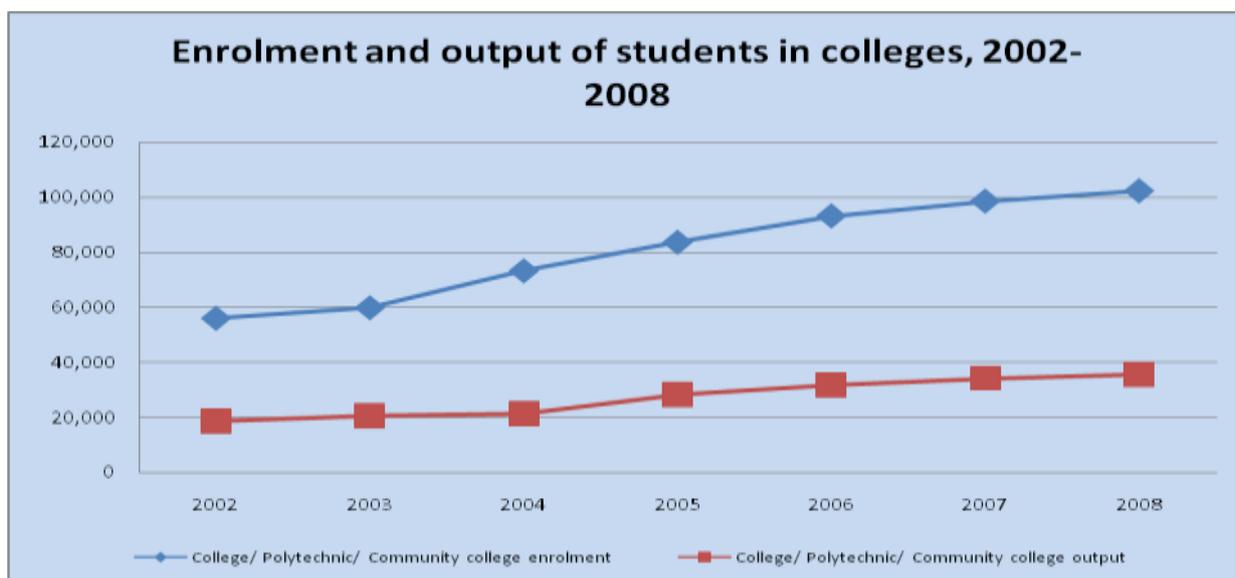


Figure 2.3. Enrolment and output of students in colleges, 2002–2008

Source: MOHE (2008)

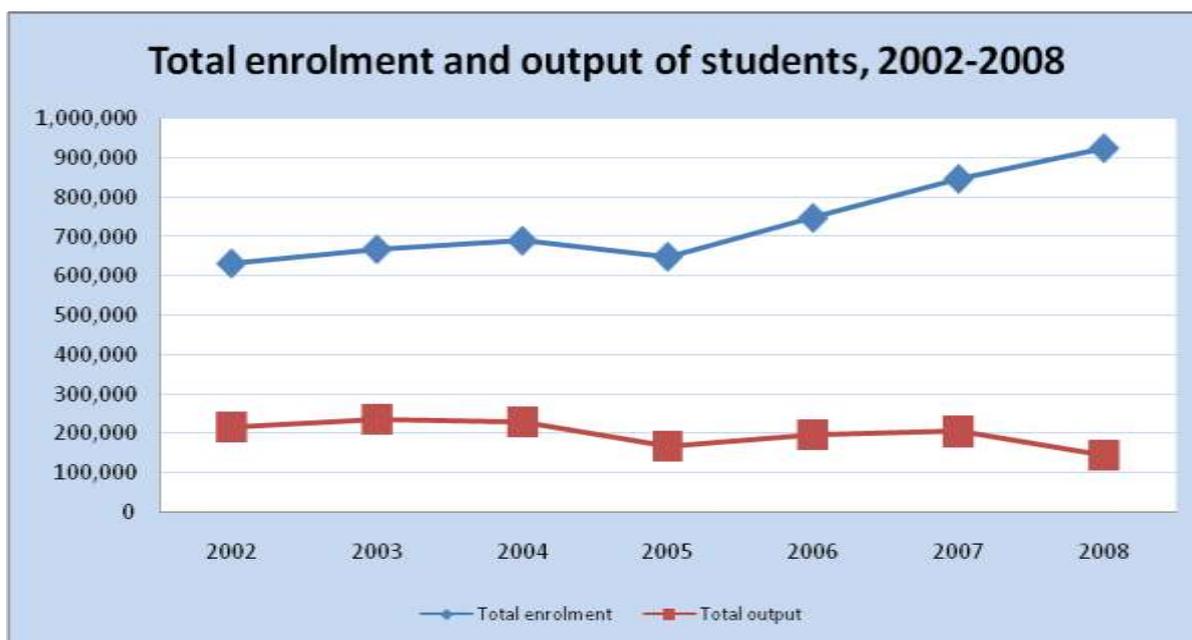


Figure 2.4. Total enrolment and output of students, 2002–2008

Source: MOHE (2008)

94 From Table 2.2 and Figures 2.5 and 2.6, student enrolment and output for postgraduate (masters level) arts courses increased steadily between 1997 and 2004. A marked drop in student enrolment in the arts courses in 2005 was in some way compensated by a slight increase in student enrolment in the science and technical courses, resulting in a steady upward trend in overall enrolment for postgraduate (masters level) students as depicted in Figure 2.7. The output of the system however presents an interesting picture; for the arts courses, while student enrolment dipped between 2004 and 2005, output

had begun to contract much earlier, in that it began in 2003 and dipped again in 2004 (Figure 2.6). For the science and technical courses, a dip in the output of the postgraduate system was noticeable circa 2003 to 2006 but picked up again in the later years. In spite of these aberrations in the postgraduate sector, total student enrolment and output of the system was quite stable (Figure 2.7).

Table 2.2 Enrolment and output of postgraduate students at the masters level by field, 1997–2007

Field	Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Arts	Enrolment	5,948	6,416	11,529	13,836	14,005	14,142	15,496	18,415	12,988	15,903	18,012
	Output	983	2,073	2,322	2,941	3,921	5,477	4,442	3,252	3,639	3,777	4,791
Science	Enrolment	2,911	2,853	5,722	7,039	7,678	8,064	8,986	9,034	11,223	9,584	8,411
	Output	488	658	751	891	1,174	1,236	3,552	1,952	2,376	2,102	2,622
Technical	Enrolment	962	1,323	2,713	3,132	3,201	3,321	2,834	3,262	4,666	4,860	3,960
	Output	121	374	382	388	560	698	452	870	1,157	888	1,086
Total	Enrolment	9,821	10,592	19,964	24,007	24,884	25,527	27,316	30,711	28,877	30,347	30,383
	Output	1,592	3,105	3,455	4,220	5,655	7,411	8,446	6,074	7,172	6,767	8,499

Source: MOHE (2008)

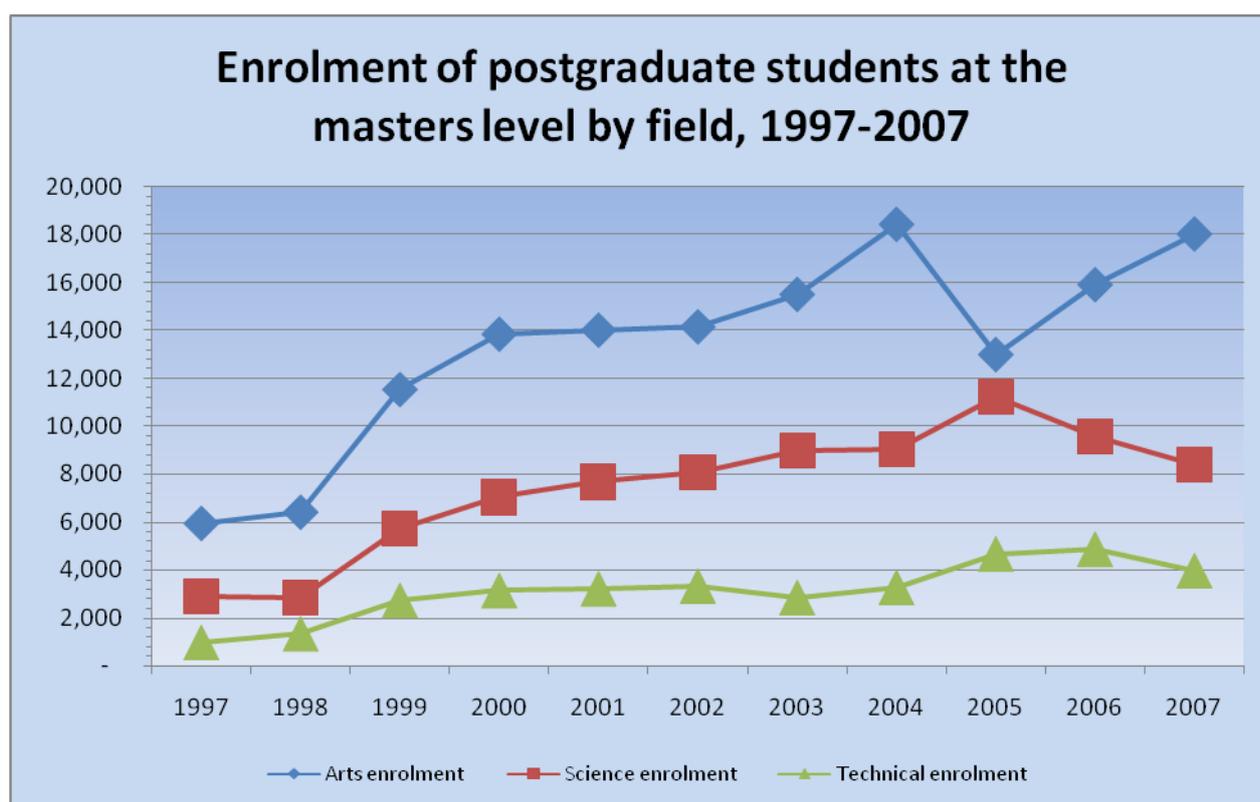


Figure 2.5. Enrolment of postgraduate students (masters level) by field, 1997–2007

Source: MOHE (2008)

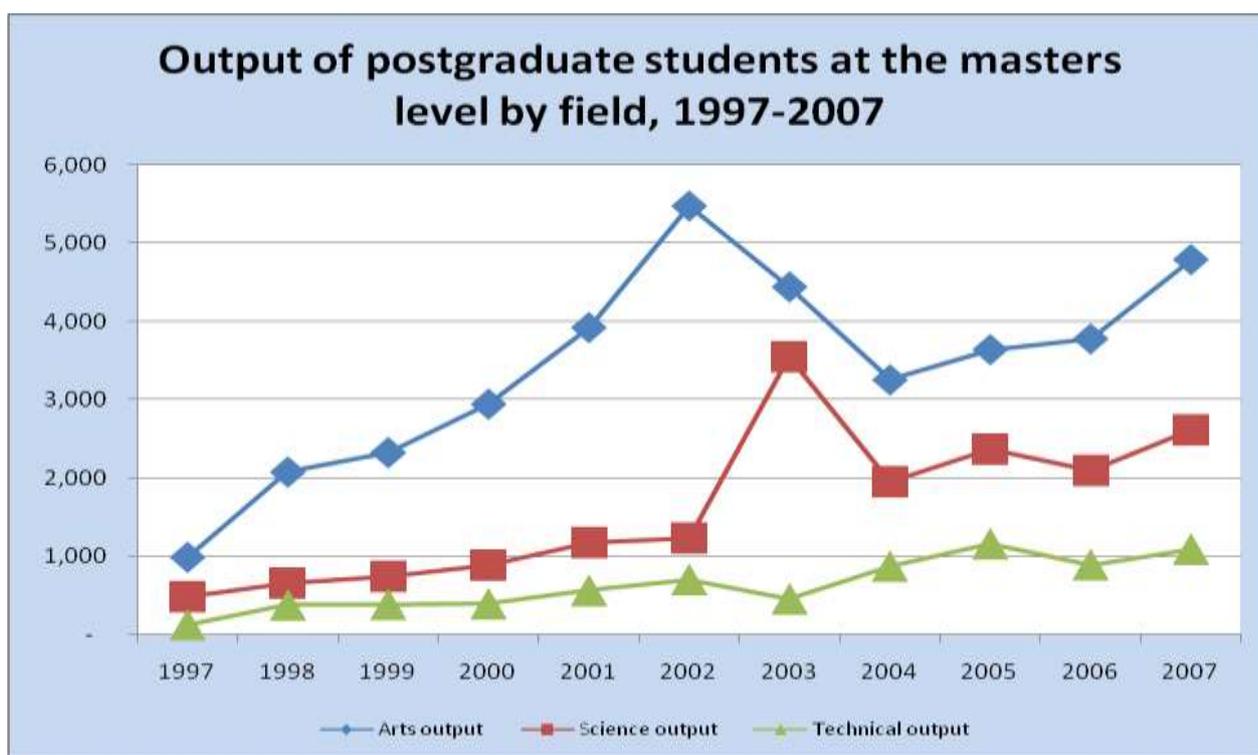


Figure 2.6. Output of postgraduate students (masters level) by field, 1997–2007

Source: MOHE (2008)

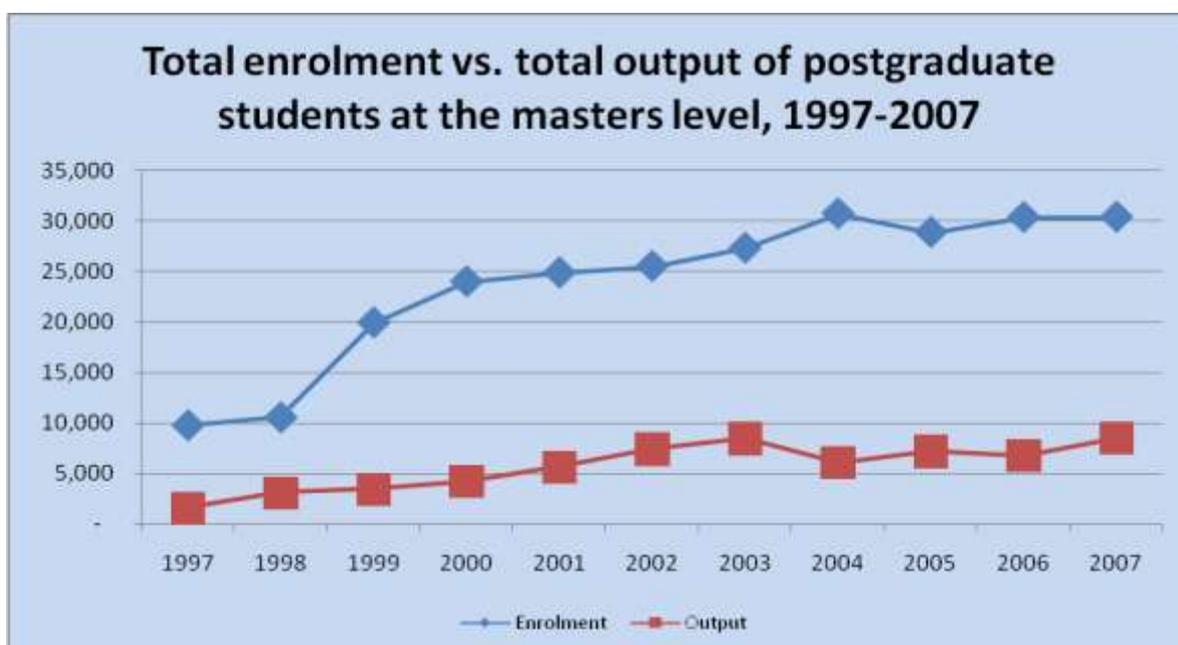


Figure 2.7. Total enrolment vs. total output of postgraduate students (masters level), 1997–2007

Source: MOHE (2008)

95 Figure 2.8 provides the pattern or trend in doctoral education in Malaysia for the period between 1997 and 2007. The gap between enrolment and output was narrow in 1997 but became increasingly wide upon approaching 2007. It can be seen that the steady increase in the enrolment rate far exceeds the increase in the rate of output especially for the period between 2004 and 2007.

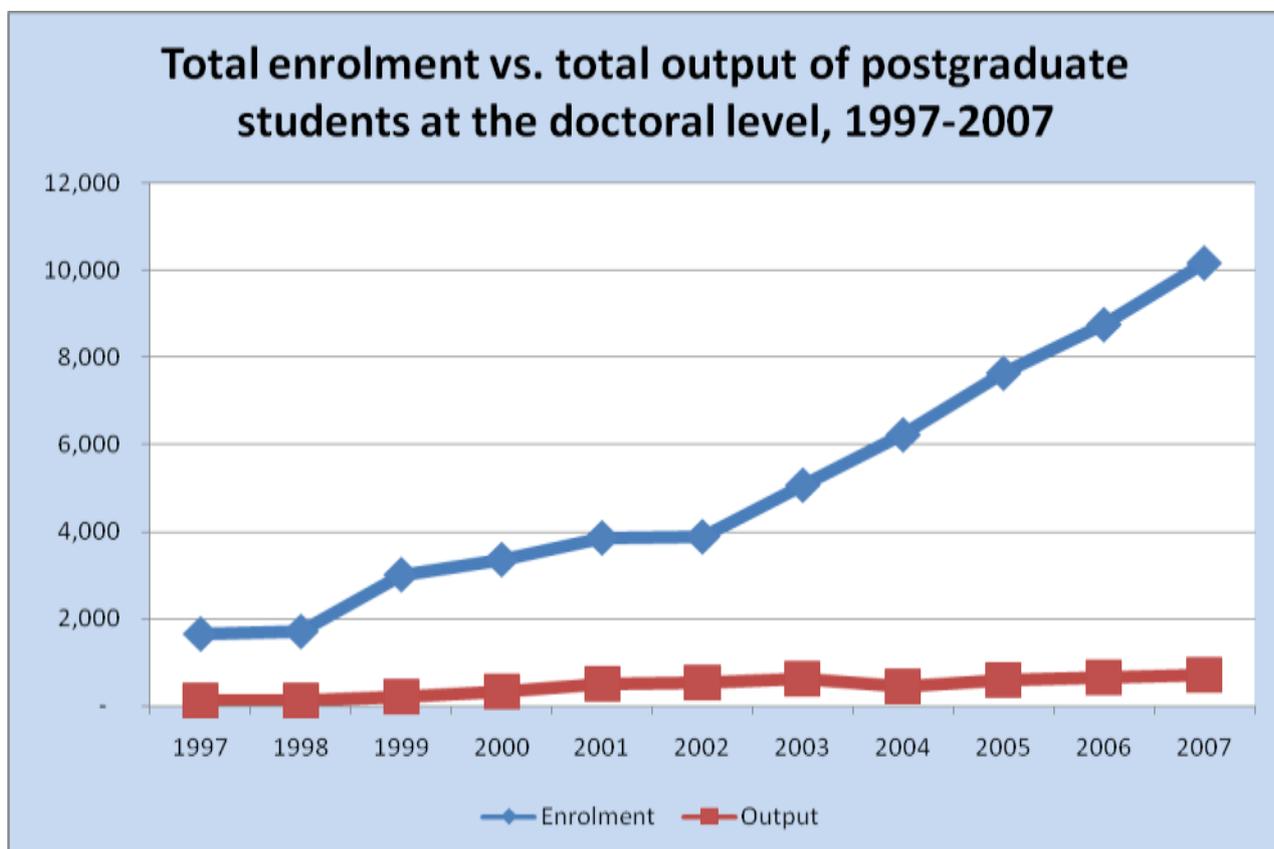


Figure 2.8. Total enrolment vs. total output of postgraduate students at the doctoral level, 1997–2007

Source: MOHE (2008)

96 Table 2.3, and Figures 2.9 and 2.10 summarize other important elements of the higher education system as of 2007. In terms of the seven key indicators of the system as listed in Table 2.3, the public sector is mostly clearly way ahead of the private sector (especially in the total number of staff with masters or PhD qualifications). The private sector, however, dominates the international student segment and employs 349 more foreign academic staff than its public counterpart.

Table 2.3 Profile of the Malaysian higher education, 2007

Key Indicator	Public HEI	Private HEI	Total
Student enrolment	382,997	365,800	748,797
Graduate output	85,448	83,431	168,879
Number of international students	14,324	33,604	47,928
Number of academic staff	23,567	18,081	41,648
Number of staff with PhDs	6,109	1,670	7,779
Number of staff with masters	12,717	6,846	19,563
Number of foreign staff	1,027	1,376	2,403
Number of Malaysian students studying abroad	54,915		

Source: MOHE (2008)

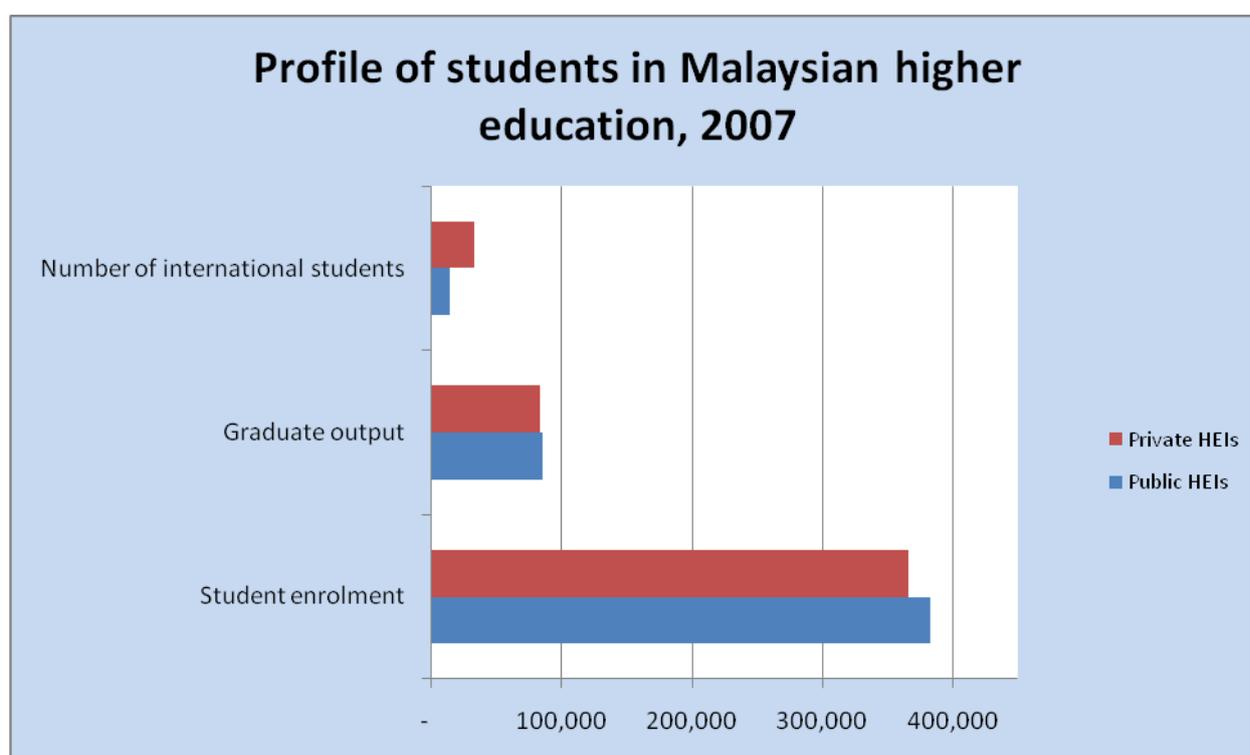


Figure 2.9. Profile of students in Malaysian higher education, 2007

Source: MOHE (2008)

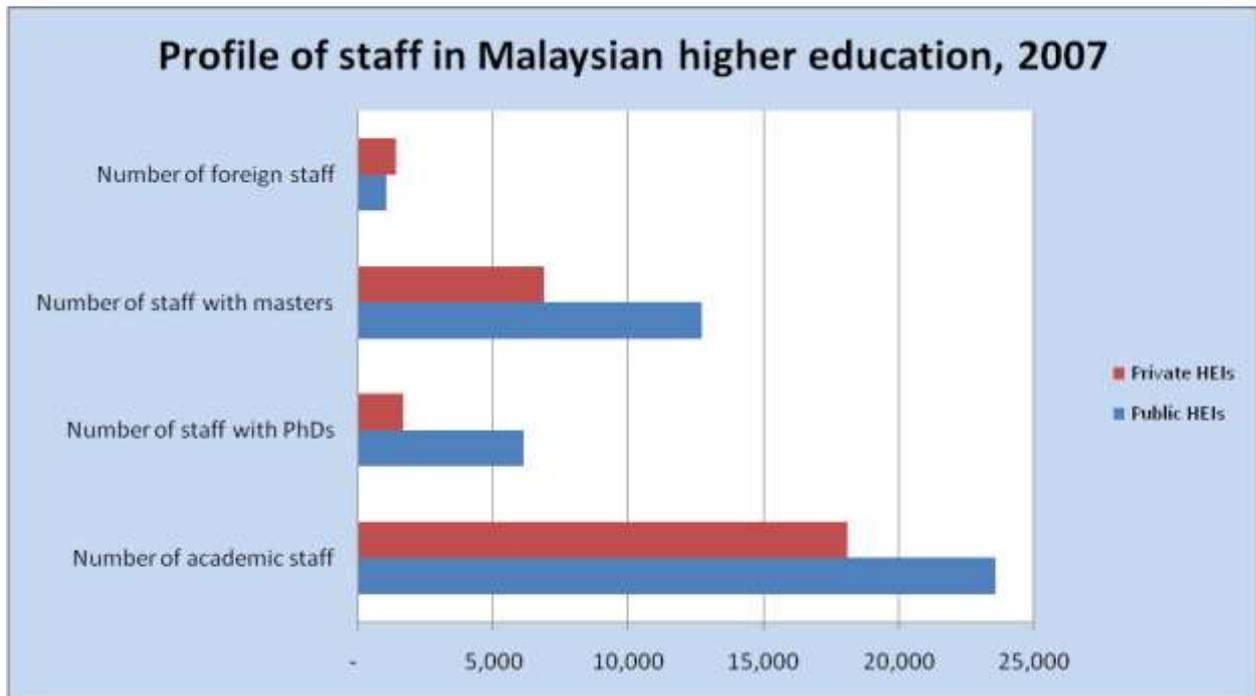


Figure 2.10. Profile of staff in Malaysian higher education, 2007

Source: MOHE (2008)

97 The government of Malaysia is now moving towards a fairly aggressive strategy for international recruitment, expecting to target 100,000 international students by 2010 (the figure has now been revised to 60,000), and these countries include Thailand, Indonesia, China and the Middle East. Several overseas universities have established branches in Malaysia: Australia’s Monash University, Swinburne University and Curtin University of Technology; and United Kingdom’s Nottingham University, De Montfort University (which has provided engineering and business courses in Malaysia since 1994) and Lancaster University (which offers dual undergraduate degrees in business, computers and psychology with the private Sunway University College). Malaysia is an attractive study abroad option as it offers quality education at comparatively low tuition fees (around \$6,600 for private universities and \$2,890 for public universities), affordable living costs along with political stability and a harmonious multi-ethnic and multi-cultural experience, as well as English as the medium of instruction for foreign students (The OBHE, 2009). Higher education institutions in Malaysia offer a wide range of programmes in the technical, medical, professional, business and liberal arts field. The 9th Malaysian Plan (2006–2010) places high priority on increasing accessibility to higher education in order to create a critical mass of trained, skilled and knowledgeable workforce who would sustain economic growth, increase competitiveness and support a knowledge-based economy (The World Bank Report, 2007). The plan aims to enroll 1.6 million students or 40% of the 17–23 age cohort in tertiary education by the year 2010. It is expected that 50% of these students will come from private higher education institutions.

98 No data analysis in the form of an extensive review of higher education has been performed at the national level to establish the demand and supply of different types of higher education ‘products’. Rather, most data generated are only on capacity. No doubt the commitment to higher education and large-scale investments continue to receive due consideration by the government of Malaysia. Enrolments in undergraduate programmes at public universities increased by 37.60% during the 2000–2003 period and by 20.00% between 2003 and 2005; enrolments in the private universities and

university colleges increased by 60.10% from 1998 to 2000 and by 19.20% during the 2000–2005 period.

2.2 Governance and Regulatory Framework for the Higher Education System

2.2.1 Quality Assurance Practices

99 By definition, public universities in Malaysia by virtue of being state-controlled universities are statutory bodies and their setting up is governed by specific laws (Morshidi, 2008). Education reforms governing both public and private higher education were tabled in 1996, namely the Education Act 1996, Private Higher Educational Act 1996, National Council on Higher Education Act 1996, National Accreditation Board Act 1996 and Universities and University Colleges (Amendment) Act 1996 (Appendix I). These reforms provide the necessary regulatory framework for the liberalisation and privatisation of higher education on a larger scale to meet the social and economic needs of the country (Morshidi, 2006). Reflecting the importance the government of Malaysia gives to the higher education sub-sector, and the critical need to modernize and improve its operations, the Ministry of Higher Education (MOHE) was established in 2004 with the responsibility of providing strategic direction and overseeing the development of the said sub-sector. The other governance structure, the National Council of Higher Education was established in 1996 to plan and coordinate both the public and private sectors of higher education. The council which is chaired by the Minister of Higher Education determines policies in relation to staff salaries in public institutions, fees, student selection, funding, courses of study and other matters.

100 The Malaysian government introduced corporate governance for state-controlled universities in 1996 by amending the University and University Colleges Act 1971, paving the way for the incorporation of public universities. Incorporated universities should operate as efficient, transparent and financially able entities. While there are engaging discourses globally in the usage of the terms ‘incorporated’ (commonly used in the Japanese and American higher education context) and ‘corporatised’ (adopting corporate style management), in the Malaysian context, public universities which have been ‘corporatised’ are incorporated entities expected to adopt management systems similar to those of the corporate sector while at the same time accepting the fact that the government will retain explicit control (Morshidi, 2008). Because the universities adhere closely to government objectives, these institutions are therefore publicly funded. Alongside the incorporated public universities, there are private universities in Malaysia which operate in a more corporate style than public universities which are tagged ‘corporatised’ entities. Examples of some private universities in Malaysia include Universiti Teknologi Petronas, Universiti Tenaga Malaysia, Limkokwing University of Creative Technology and Multimedia University.

101 While public universities can determine the fees for postgraduate students (this is the main source of income for incorporated universities), the undergraduate student fees must adhere strictly to the guidelines laid out by the MOHE (Morshidi, 2006). Revenue for operating activities arising from student fees has continued to decrease while income from consultancy, contract research, sale of expert services and other market-related activities has become an important source of revenue for many public universities in Malaysia.

102 Private higher education institutions in Malaysia do not enjoy any direct public funding or other forms of incentives that are extended to private companies in the manufacturing and hospitality sector. This situation is a sore point among private higher education providers. Private higher education institutions are generally funded by private companies, charitable organisations, foundations or hybrids comprising various players of the higher education scene.

103 To date, the MOHE and the National Council of Higher Education have performed their functions along the model of a centralised governance and management system that has granted some degree of autonomy to the public universities but not the authority to manage key aspects of their operations. Malaysian universities generally have less management autonomy than universities in developed countries.

104 For the first 40 years after independence in 1957, the basis of the higher education sector has been the public universities. In December 2005, the government of Malaysia approved the long-delayed creation of the Malaysian Qualifications Agency (MQA). The MQA was formed by the merger of the National Accreditation Board (LAN — the private sector accreditation body) and MOHE's Quality Assurance Division (QAD) (the public sector equivalent). This agency established the Malaysian Qualifications Register (MQR) which only registers programmes that have received accreditation by the MQA. It signals a shift from content to 'learning outcome domains' which specify the skills gained by graduates. The ultimate purpose is to facilitate international recognition of qualifications from public and private universities in Malaysia. The MQA oversees five accreditation committees, one for each of the following fields: the social sciences, information and communication technologies (ICT), engineering and technology, arts and humanities, and medicine and allied health sciences. Another function of the MQA is to maintain liaison and cooperation with quality assurance and accreditation bodies in higher education abroad. Indeed, training for the MQA is provided by the United Kingdom Quality Assurance Agency (UK QAA) and similar bodies elsewhere. In August 2007, the government of Malaysia launched two documents, the National Higher Education Strategic Plan and Higher Education Action Plan 2007–2010. Local higher learning institutions need to be at their best by August 2009 as they will be audited by ten teams from the MQA.

105 QAD, established under the aegis of the government of Malaysia and MOHE in April 2002, manages and coordinates the quality assurance system of public universities. This unit, funded entirely by the MOHE, has a director who reports directly to the MOHE. Since its inception, it has developed a manual entitled "Quality Assurance Code of Practice in Public Universities" to guide institutions in carrying out the quality assurance exercise which includes a self-study, followed by an external review. The mandates of the QAD are as follow:

- developing standards and criteria for academic programmes at both undergraduate and graduate levels;
- developing procedures for quality assurance and conducting academic reviews;
- providing reports of academic reviews including analytical and benchmarking outcomes;
- disseminating good practices, monitoring quality enhancement activities and conducting training programmes in quality assurance; and
- developing a national qualifications framework (the Malaysian Qualifications Framework (MQF))

2.2.2 Funding Mechanisms

106 In terms of resource mobilisation, the government of Malaysia has given priority to human resource development, and the vision of the importance of higher education has translated into significant investment to develop the sector. In the 8th Malaysian Plan, the government of Malaysia allocated RM8.9 billion out of RM18.7 billion for tertiary education. Compared to the financial effort of other countries on behalf of their tertiary education, the government of Malaysia appears to be among the most generous (about 2.70% of the nation's Gross Domestic Product (GDP)).

107 Malaysia still relies on a traditional historical/negotiated allocation approach to distribute the budget among the public universities. Every year, each university submits a budget proposal based on enrolment intake numbers decided by the MOHE. The Ministry of Finance then makes the final

allocation which usually reflects the previous year's allocation plus a small increase based on the overall availability of public resources. In 1997, while the government of Malaysia introduced the Modified Budgeting System (MBS) which operates as an output-oriented budget allocation, funds were still distributed on the basis of an incremental-cost approach linked to inputs.

108 The National Higher Education Fund Corporation (NHEFC) was introduced by the government of Malaysia in 1997 with the purpose of addressing issues of equity and accessibility in offering subsidised loans to help students meet the high tuition fees charged by the newly established private higher education institutions. Eligibility for these loans was extended to public university students a few years later, despite the prevailing level of subsidy provided for the said students. Since 1997, several recommendations have been made in order for the NHEFC to be financially sustainable. The student loan programme needs adjustments in the following areas: the eligibility criteria (too wide), schedule of loan amounts (scheduled to type of studies), issue of (inappropriate) targeting in terms of balance between public and private university students (only 32% of loan beneficiaries have been students attending private higher education institutions), repayment period, staff numbers (too high — 350 staff in NHEFC) and (lack of) financial sustainability of the student loan scheme. The NHEFC management estimates that it recovers only 25% of the total amount it should be receiving (The World Bank, 2007). Between 1997 and 2005, about RM15.1 billion was committed to approximately 800,000 students (Table 2.4), and students attending private higher education institutions accounted for around 20% of all students in higher learning. In terms of the amount of loan, students in private higher education receive the quantum of the loan amount as their tuition fees are significantly higher than those in the public higher education institutions. A study was commissioned recently to assess the NHEFC, but so far, there has been no official statement on its future operation and management.

Table 2.4 Allocation of the National Higher Education Fund

Year	No. of Students in Public Universities	No. of Students in Private Universities	Total No. of Students	Proportion of Students from Private Institutions	Amount of Loan (RM million)
1997	11,905	179	12,084	1.50%	219.5
1998	17,564	718	18,282	3.90%	365.6
1999	76,389	6,769	83,158	8.10%	1,683.6
2000	85,764	8,286	94,050	8.80%	1,849.6
2001	84,306	26,338	110,644	23.80%	2,134.1
2002	86,186	19,591	105,777	18.50%	1,981.2
2003	86,057	26,564	112,621	23.60%	1,863.4
2004	88,282	30,829	119,111	25.90%	2,268.4
2005	98,755	45,704	144,459	31.60%	2,762.9
Total	635,208	164,978	800,186	20.60%	15,128.3

Source: MOHE (2008)

109 The Malaysian higher education sector includes a wide range of diverse types of institutions with a strong commitment to equity and quality. Universities are encouraged to diversify their funding and revenue sources through a range of joint ventures, partnerships and engagement with the industry and community. In terms of research and innovation practices, several public universities have produced the bulk of scientific papers being seen as generated by Malaysian institutions overall, especially in the areas of chemistry, clinical medicine, engineering, material science, physics, and plant and animal science (The World Bank, 2007). Examples of globally excellent university-based research institutions and programmes are the National Center for Drug Research and the Pharmacology Programme at Universiti Sains Malaysia, and the award winning digital media programme offered by the private Multimedia University.

2.2.3 Characteristics of Institutional Relationships

110 The Higher Education Minister encourages competition among institutions of higher education in the country. As of 2009, about 20 public universities and 29 private higher education institutions have signed up for this year's Malaysian Benchmarking System for Institutions of Higher Learning (Setara) Program. Setara involves a quantitative (rating) survey where data collected is analysed according to six areas. This program helps institutions gain recognition in the local and global arena. Malaysia is mindful of most of the global ranking systems in its bid to stay competitive (the United Kingdom's Times Higher Education Supplement, Shanghai Jiao Tong's university rankings and Asia Week's rankings). Benchmarking management education in Malaysian universities is also of relevance, considering the importance of developing an entrepreneurial culture among graduates. Part-time and full-time Master of Business Administration (MBA) programmes are offered in nine Malaysian institutions (public and private).

111 The present centralised governance system of the Malaysian higher education sector is faced with considerable constraints that hinder public universities to fulfill their potential to the fullest and be classified as 'world-class' universities. Public and private higher education institutions operate under different regulatory and financing rules, resulting in the absence of a unified higher education system. Universities would be more competitive if they had the ability to select their own students on their own terms (with the exception of Universiti Sains Malaysia which was granted the Accelerated Program for Excellence (APEX) status in September 2008), offer competitive compensation packages to retain their best faculty, and appoint highly qualified university leaders based on an open search process led by the university boards (presently, vice chancellors are appointed by the government).

2.3 Regional Dimension 'inside' the National Higher Education Policy

112 The information in this section on regional dimension of the national higher education policy is derived from work published in Morshidi (2009). Regional and city development is about reducing disparities and inequity at three spatial levels: inter-regional, inter-city and urban-rural. Since 1970, Malaysia has adopted an affirmative policy framework aimed at addressing regional economic imbalances, which incidentally coincides with regional ethnic disparities. The establishment of Universiti Sains Malaysia outside the traditional core region reflects a bold attempt to use higher education as an instrument to redress ethnic inequity and regional imbalances. However, this appears to be an isolated case up till the late 1980s. Several public universities were established in the core region (Kuala Lumpur and Selangor) which is the powerhouse of the Malaysian economy. While national policy to address regional problems in the 1970s and 1980s favoured a strategy of dispersal of production activities from the core, this however, was not complemented with a policy utilising higher education for human capital formation in target regions. Thus, while some manufacturing activities were dispersed and began operations in the lagging and peripheral regions, they soon realised the difficulty in recruiting professional and technical workers locally as the pool for this category of workers was very limited. Furthermore, as the living and recreational conditions in the peripheral regions were not conducive for in-migration of professional and skilled workers from the core, the problems became insurmountable.

113 With the realisation that higher education is an important tool for national unity, public universities were subsequently established outside the core region in the early 1990s. The global trend in the massification of higher education, unmet demands for university places in Malaysia, depressing national economic situation in the early 1990s coupled with other developments in the global landscape of higher education led to several major reforms in the higher education system in the mid 1990s. The important role of higher education and higher education institutions in stimulating development and human capital development in the lagging and less developed regions were soon acknowledged and subsequently, several public universities and higher education institutions were established in these

regions. As of now, there is at least one state-controlled university in every state/region in Malaysia. Apart from being a tool for national unity, these institutions are playing an important role in increasing accessibility to higher education, and stimulating growth and social development in their respective regions.

114 Penang, a sub-region of the much larger northern region, is neither a lagging nor peripheral region. This sub-region commands an important position in the national spatial system after the core region. After losing free port status in the 1960s, Penang's strategic location as the centre for electrical and electronic (E&E) industries was fully exploited in the 1970s and 1980s. In the 1980s, Penang became an important regional industrial complex for the production of semiconductors and other related products in Malaysia and the Asia Pacific region. Arguably, the regional development strategy in the 1980s and 1990s was based on the objective of maximising opportunities within the global production networks of the E&E, textile and garments industry.

115 The co-location of Universiti Sains Malaysia and the Penang Free Trade Zone (FTZ) (now Free Industrial Zone (FIZ)) on Penang Island should have been exploited to the fullest in terms of synergy and collaboration. However, this was not to be the case, for majority of the industries in the regional production complex through the 1970s and 1980s were primarily involved in the developed end of the semiconductor product life cycle (largely in the assembly stage), with very little research activities carried out. The presence of Universiti Sains Malaysia in Penang therefore could not be fully taken advantage of. However, in the late 1990s, with industrial upgrading and the shift from assembly related activities to high technology products and manufacturing processes (with a focus on research and innovation), the important role of higher education in human capital formation was appropriately emphasised.

116 Admittedly, the globalisation and internationalisation of higher education have, in some important ways, diverted attention from the role of higher education at the regional level. The National Higher Education Strategic Plan 2020 has clearly spelt out the role of higher education in increasing access to and equity in higher education, spurring human capital formation, positioning Malaysia in the international arena but it has no explicit spatial biases aimed at redressing disparities at the regional and city level. Apparently, the old adage "what is good for the nation is good for the region" seems to be the underlying assumption of the plan. Unfortunately, when higher education institutions take a similar stance and position, increasingly there is a tendency to go beyond their respective "backyards" (regions); they become actively engaged with the global and neglect the region. Arguably, with resource constraints, not all universities should be required to be active at both the regional and global level. Some need to concentrate on their regional role with very intense and meaningful engagement with the regional and local community, maximising impact on the stakeholders. As Penang is a small sub-region and is economically more developed, engaging both the local and global community is desirable and feasible for a university such as Universiti Sains Malaysia.

2.4 Regional Higher Education System and Governance (Penang region)

2.4.1 Profile of Universiti Sains Malaysia and Private Higher Education Institutions

117 As of 2009, the state of Penang has 22 public institutions of higher learning (consisting of branch campuses, training institutes and centres, and community colleges) and 31 private educational institutions offering various postsecondary courses ranging from certificate to degree levels that prepare graduates and working adults for career advancement. About 50% of the private higher education institutions were established in the 1990s and 23% during the 1980s, most of which are small in terms of enrolment and physical facilities. About 60% of them have their own buildings and premises, whereas the rest are renting premises. Student enrolment in private higher education institutions in year 2007 stands at 13,202 students and increased only by around 10% (14,641 students) in year 2008. In

terms of ethnicity, a majority of the students (about 60%) are Chinese, followed by Malays, Indians and others. Local students studying in private higher education institutions hail mostly from the northern region states of Perlis, Kedah and Perak, with the majority from Penang. In 2006 and 2007, there were 452 and 650 international students respectively studying in Penang. They were mostly from Indonesia, China and Thailand while others came from India, Korea, Mongolia, Nigeria, Taiwan, Japan and the Middle East. The levels of courses offered by private higher education institutions (approved by LAN) include preuniversity, certificate, diploma, degree, postgraduate and professional. Private institutions also provide twinning programmes with overseas universities (made up of 3+0, 2+1 and 1+2 models).

Table 2.5 Number of students enrolled in private higher education institutions in the Penang region, 2007 and 2008

Year	Local Student			Foreign Student
	Male	Female	Total	
2007	6,745	6,457	13,202	452
2008	7,216	7,425	14,641	650

Source: MOHE (2008)

118 Universiti Sains Malaysia is the main public university in the state of Penang. It is the second oldest university in Malaysia and was established in 1969, 20 years after the inception of the University of Malaya, the first university in the country. It was established after the Penang State Executive Committee decided in 1962 that the state needed an educational institution to provide higher education for the benefit of Penang and northern Malaya. The campus at Minden (Penang Island) comprises 239 hectares. The university has two other campuses, one in Kubang Kerian, Kelantan (offering medical and nursing courses on a 73-hectare campus) and the other in Trans Krian, Perak (offering engineering courses). Universiti Sains Malaysia's Advanced Medical and Dental Institute (AMDI) is operating from a 130-hectare campus in Bertam, mainland Penang. The campuses in Kubang Kerian and Trans Krian have been established as part of Universiti Sains Malaysia's commitment to regional development. In 1979, the School of Medical Sciences was started in Kubang Kerian, Kelantan on the east coast of Peninsular Malaysia. This signaled the national government's commitment to the rural, ethnic Malay, majority parts of the country (Morshidi, 2002). In 1986, the engineering schools were relocated to Tronoh, Perak, a lagging sub-region in northern Malaysia. In the early 1980s, the relocation of the School of Medical Sciences to Kubang Kerian from the Minden campus was completed. With this move, Universiti Sains Malaysia took charge of a newly completed hospital in Kelantan from the Ministry of Health in 1983, and converted it into a teaching hospital which incorporated an integrated clinical-based curriculum which aims to meet the country's manpower needs for doctors well qualified in relation to local conditions (Morshidi, 2002).

119 When it was first established, the university offered solely science courses but later added courses in the arts and education as part of its expansion programme. The academic programmes offered at Universiti Sains Malaysia today are undergraduate and postgraduate degrees, non-graduating programmes and certificate courses, diploma programmes and off-campus study programmes. The School of Off-campus Studies, established in 1971, has been Universiti Sains Malaysia's most prominent feature as it was the first distance learning programme at the tertiary level in Malaysia. This programme has enabled many adult learners who otherwise might not have the chance to pursue tertiary education without sacrificing their careers. It offers degrees in the sciences, humanities, social sciences and civil engineering. Currently, Universiti Sains Malaysia has 27 schools conducting academic programmes and more than 20 research and service institutes specialising in research activities (Universiti Sains Malaysia, 2010).

120 Universiti Sains Malaysia offered higher education degree programmes as early as late 1970s. Initially, only candidates for postgraduate study by research were admitted. In subsequent years, various types of other programmes combining coursework and research or by coursework alone were introduced. Presently, Universiti Sains Malaysia has a graduate student population of about 6,896 of which research students continue to constitute more than 20% of the total student population. Altogether, 1,417 of the graduate students are international students. Graduate students, enrolled in postgraduate programmes in the field of medicine, science and technology, engineering and arts, are working towards their master's or doctorate degrees. Table 2.6 presents the profile of students at Universiti Sains Malaysia.

121 The academic programme at Universiti Sains Malaysia is based on three main principles. First, the courses offered have to meet the country's requirements and interests. Second, the form and functions of its education have to be different from those offered by other local universities while at the same time, ensuring a balance between courses. Third, the university has to provide for research and the accumulation, advancement and dissemination of knowledge. It also has to strive to integrate its educational and research programmes with the requirements of the society. Universiti Sains Malaysia has a sound inter-disciplinary curriculum which is periodically reviewed to accommodate current needs. A unique feature of the academic programmes offered at Universiti Sains Malaysia is that all courses are offered through the respective schools, a break from the traditional faculty system based on departments. This school system has the added flexibility to accommodate the different interests and talents of the university students as it allows for specialisation in a chosen field and encourages comparative and inter-disciplinary studies in the respective areas.

Table 2.6 Profile of students at Universiti Sains Malaysia, 2004–2008

Data	Year				
	2004	2005	2006	2007	2008
Total no. of full-time students (local and international including postgraduate students)	21,828	22,354	21,869	21,117	20,276
i. Total no. of local students	20,963	21,294	20,543	19,507	18,269
ii. Total no. of international students	865	1,060	1,326	1,610	2,007
i.No. of undergraduate students	18,148	18,541	17,940	16,700	15,270
a. No. of local students	18,026	18,378	17,768	16,507	14,954
b. No. of international students	122	163	172	193	316
a.Bachelor students	18,148	18,541	17,940	16,610	15,088
b.Diploma students	-	-	-	90	182
ii.No. of postgraduate students	3,680	3,813	3,929	4,417	5,006
a. No. of local students	2,937	2,916	2,775	3,000	3,315
b. No. of international students	743	897	1,154	1,417	1,691
a.Masters students	2,945	2,968	2,864	3,063	3,380
b.PhD students	735	845	1,065	1,354	1,626
No. of research centres (with its own operating budget and/or postgraduate students)	13	13	13	13	13

Note: figures for 2006–2008 are based on Universiti Sains Malaysia’s unaudited data, and student data are based on full-time students only

Source: Abdul Razak & Mohamed (2008)

122 There are two categories of staff at Universiti Sains Malaysia: academic and non-academic. Overall, there has been a steady increase in the total number of Universiti Sains Malaysia staff from 1989 to 2009 (Table 2.7). However, as emphasised in Figure 2.11, starting from around 1999, the increase in non-academic staff exceeds the increase in academic personnel especially in the last few years (2004–2009). Hence, it is clear that the recent overall increasing trend of staff at Universiti Sains Malaysia is mainly due to the increase in the non-teaching category.

Table 2.7 Number of staff at Universiti Sains Malaysia, 1989–2009

Category	Year																		
	1989/90	1991/92	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Academic	961	1,060	1,424	1,434	1,434	1,434	1,180	1,193	1,203	1,278	1,369	1,456	1,462	1,533	1,565	1,597	1,644	1,760	1,908
Non-academic	3,921	4,076	4,627	4,648	4,658	4,658	4,109	4,076	4,133	4,329	4,477	4,745	5,017	5,402	5,646	6,077	6,535	7,104	7,317
Total	4,882	5,136	6,051	6,082	6,092	6,092	5,289	5,269	5,336	5,607	5,846	6,201	6,479	6,935	7,211	7,674	8,179	8,864	9,225

Note: figures for 2009 are from the Universiti Sains Malaysia Annual Report, 2009 (unaudited and unpublished)

Source: Universiti Sains Malaysia, Annual Reports (1989–2009)

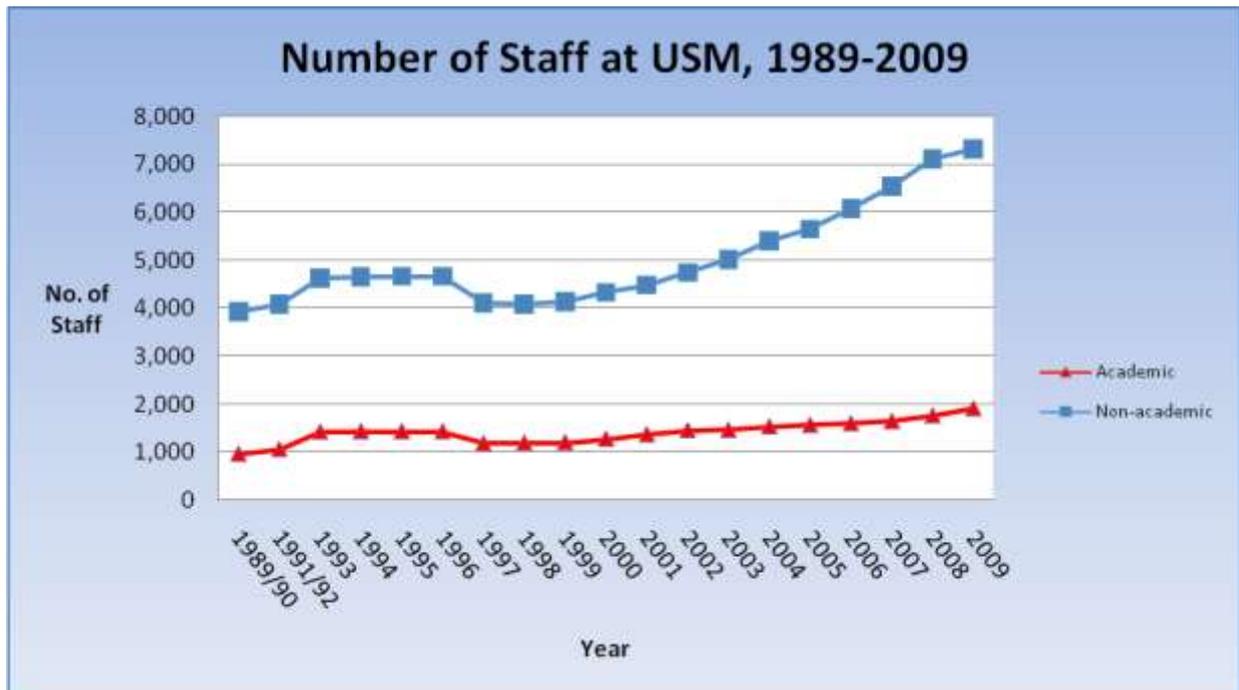


Figure 2.11. Number of staff at Universiti Sains Malaysia, 1989–2009

Note: figures for 2009 are from the Universiti Sains Malaysia Annual Report, 2009 (unaudited and unpublished)

Source: Universiti Sains Malaysia, Annual Reports (1989–2009)

123 The academic staff at Universiti Sains Malaysia consists of professors, associate professors, senior lecturers and lecturers (Table 2.8). Figure 2.12 indicates that, from 2007 to 2008, there was a sharp increase in the number of senior lectures at Universiti Sains Malaysia, and noticeably, also a marked decline in the number of lecturers. This situation was primarily due to a change in the scheme of service for public university lecturers in Malaysia; lecturers with a PhD qualification were promoted to senior positions after having served the university for three years.

Table 2.8 Profile of the academic staff at Universiti Sains Malaysia, 2004–2008

Data	Year				
	2004	2005	2006	2007	2008
No. of academic staff (permanent/contract staff only) — not including staff on study leave	1,140	1,167	1,195	1,263	1,380
a. Professors	111	109	124	131	157
b. Associate professors	357	331	300	325	331
c. Senior lecturers	159	241	231	356	729
d. Lecturers	513	486	540	451	163

Note: figures for 2006–2008 are based on Universiti Sains Malaysia’s unaudited data

Source: Abdul Razak & Mohamed (2008)

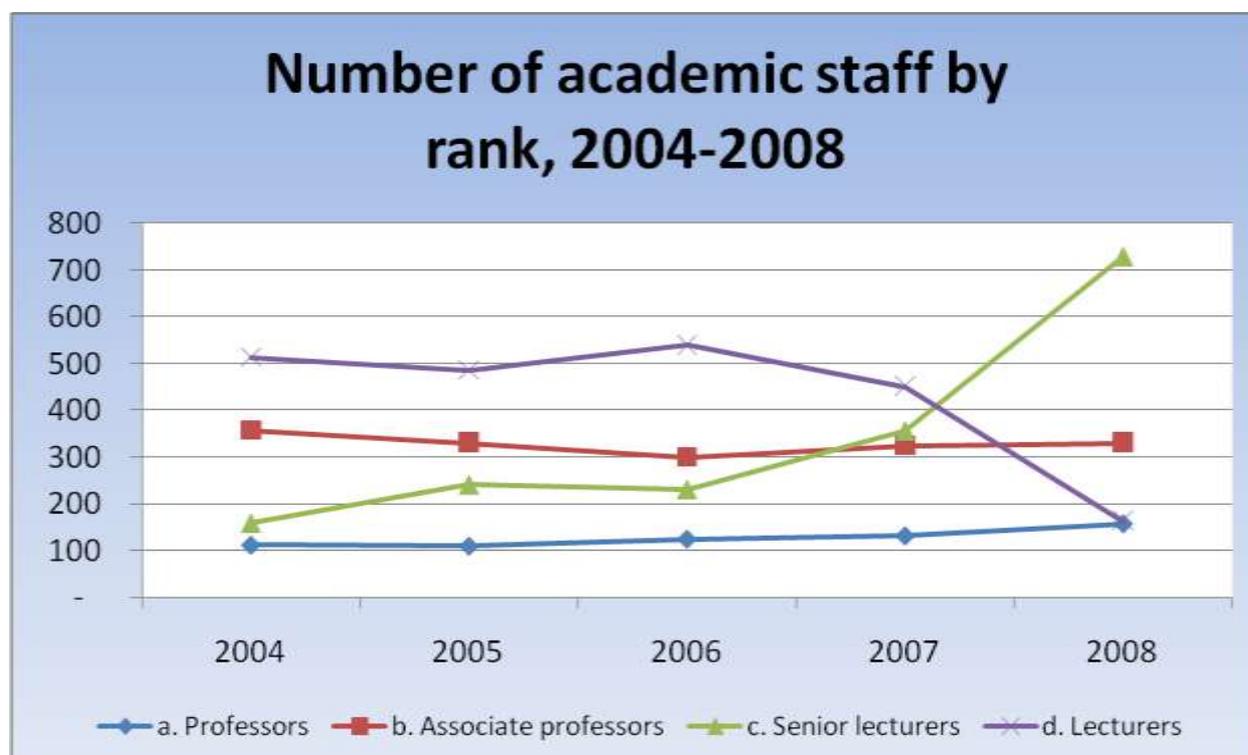


Figure 2.12. Number of academic staff (at University Sains Malaysia) by rank, 2004–2008

Note: figures for 2006–2008 are based on Universiti Sains Malaysia’s unaudited data

Source: Abdul Razak & Mohamed (2008)

124 As of 2010, Universiti Sains Malaysia has 27 schools, seven research platforms, two academic service centres and no less than 21 research and service institutes. The university's management is comprised of the vice chancellor, four deputy vice chancellors (for academic and international affairs, research and innovation, student welfare and development, and industry and community network) and six other members (three directors of centres, the registrar, the bursar and the chief librarian). The Chancellery department houses the offices of the vice chancellor and deputy vice chancellors, and is supported by departments covering development and corporate offices, public relations, management and research innovation, bursaries and other areas. With a chancellor and two pro-chancellors, Universiti Sains Malaysia's board of directors comprises a chairman, the vice chancellor, two government representatives, one local society representative, three appointees of the Minister of Higher Education and a secretary. Universiti Sains Malaysia received an allocation of approximately RM88.5 million from the government for development in 2006. As stated in Universiti Sains Malaysia's Annual Report (2006), total revenue for operating activities for the financial year ended 31 December 2006 increased by 9% from the previous year. Of the revenue for operating activities, 90.90 % (RM55.7 million) was from government grants, 6.60% (RM38.6 million) from student fees and 2.50% (RM15.0 million) from other sources.

125 As for Universiti Sains Malaysia's student funding mechanisms, monetary assistance is awarded in the form of loans and scholarships to the students to help cover their tuition fees, accommodation cost, living expenses and so on. Figure 2.13 presents the breakdown of the monetary assistance awarded to students according to the three different campuses of Universiti Sains Malaysia (main, engineering and health) in 2008.

126 Scholarships are mostly provided for students with outstanding performances in both their academic pursuits and extra-curricular involvement (though the former carries more weight). Not everyone who applies will receive the scholarships. Loans, on the other hand, are given to almost everyone who applies, for the conditions of approval are mostly based on the applicant's financial status or background (household income level). This would explain the much larger number of loans awarded to students as compared to the scholarships awarded across the three campuses of Universiti Sains Malaysia in 2008. Most of the loans are provided by the National Higher Education Fund (PTPTN). As for the scholarships, the sponsors would normally include the Public Services Department (JPA), Petronas, Yeoh Tiong Lay Sdn. Bhd. Construction Corporation and many others (Universiti Sains Malaysia, Annual Report, 2008).

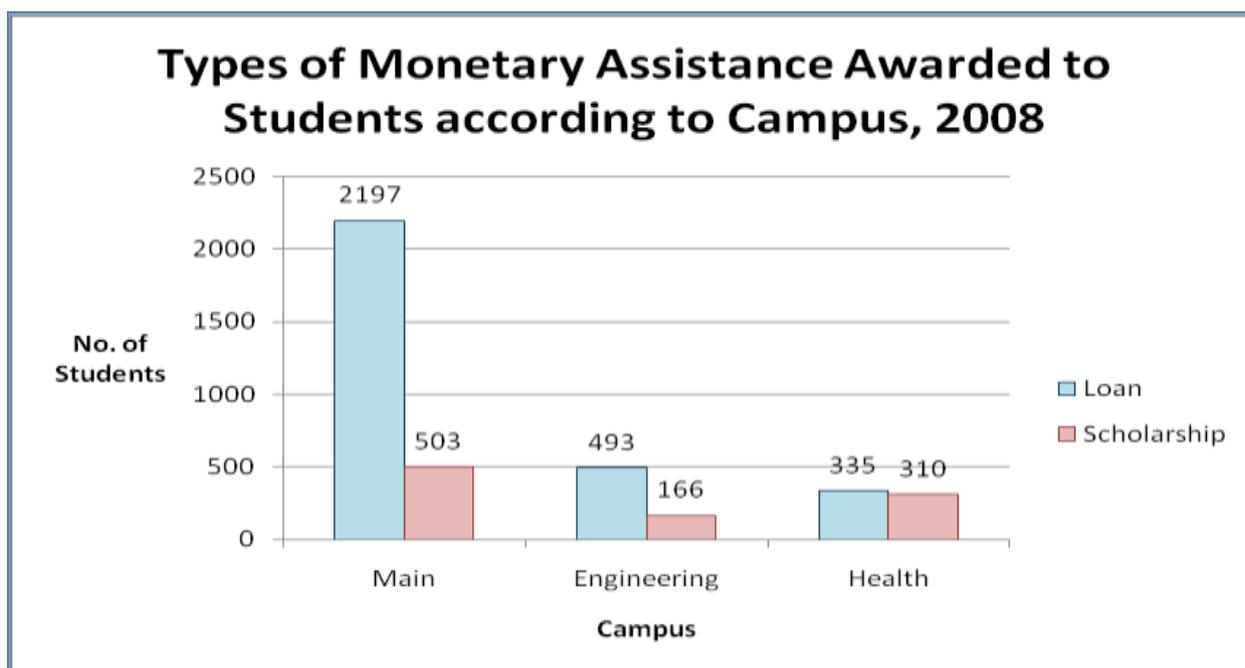


Figure 2.13. Types of monetary assistance awarded to Universiti Sains Malaysia students (by campus), 2008

Source: Universiti Sains Malaysia, Annual Report (2008)

127 Since its establishment in June 1969, Universiti Sains Malaysia has registered significant milestones and accomplishments in teaching and learning, and research and innovation. The university has strategised its responses to globalisation, marketisation and internationalisation by providing and maintaining good infrastructure, over time becoming more competitive at the national and global level. The university has been able to attract quality staff and students, locally and abroad. The university pays particular attention to matters that enhance its role as an institution of higher learning as well as meeting current needs which is in line with its mission:

“... to lead and innovate in achieving excellence at the international level through advancing and disseminating knowledge and truth, instilling qualities that stress academic excellence and professionalism, developing holistic individuals and providing a strong commitment towards society’s aspirations, the country’s vision and universal aspirations” (Universiti Sains Malaysia, Annual Report, 2006: 6).

128 Disted College is a 23-year-old non-profit college in Penang owned by the Wawasan Education Foundation and is committed to provide education and training to young students to serve the needs of the industry and community. It offers a wide range of high quality courses from the certificate to bachelor level in business, hospitality, psychology, information technology and engineering. Disted College is recognised for its association with and endorsement by a network of internationally reputed institutions in all its academic programmes. Among those institutions are Help University College, Malaysia; Curtin University of Technology, Deakin University and La Trobe University, Australia; University of Glamorgan and University of Hull, United Kingdom; and Hawaii-Pacific University, United States of America. Disted has the following established collaborative enriching initiatives:

- Industry advisory panels (IAP) for the college to keep in touch with industry players so as to make its programmes industry relevant and mould students to be more job ready.
- The Industry Networking System Promoting Industry Relevance and Employability (INSPiRE) programme to maximize first person exposure of students to industry and business leaders who will share with them their personal and professional experience of industry landscapes. It emphasises five key thrust areas: the talk series, industry experience, career and recruitment, financial support and collaboration.
- The CONNECT programme to promote a caring community culture, sensitise students to issues affecting society and engage the community in issues faced by young people.
- The Let's Go Green Campaign to mould environmentally friendly and responsible citizens and develop leadership in environmental conservation.

129 Penang Medical College (PMC) was established in 1996 with the collaboration of the Royal College of Surgeons in Ireland (RCSI) and University College Dublin (UCD). Both RCSI and UCD are constituent colleges of the National University of Ireland (NUI). The various curricula offered at PMC include medicine and surgery, general practice, medical ethics, obstetrics and gynaecology, ophthalmology, psychiatry and many more. PMC was the first college in Malaysia to offer a reverse twinning programme. Students of PMC will first undergo their pre-clinical studies and introduction to clinical work in Dublin for two and a half years. They will then be required to return to Penang to continue their clinical instruction and training either at the Penang Hospital, Seberang Jaya Hospital or at other community-based health centres in the state.

130 PMC's main objectives are to provide quality undergraduate medical education and ensure that its graduates acquire the knowledge, skills and attitudes required for the prevention and treatment of patients. PMC also trains its students to carry out research on the factors that cause diseases. Producing doctors who are sensitive to the health needs of the community and are capable of ministering to those needs are among PMC's main priorities. In addition, it is committed to the provision of postgraduate education and training, and medical education for lifelong learning and competence assurance.

131 Kolej Damansara Utama (KDU) Penang was established in 1991 and has continued to be an innovative leader. KDU was the first SMART College in Malaysia. Through its SMART initiatives, KDU aims to provide a superior learning experience to nurture students to become independent and lifelong learners. KDU offers a wide range of programmes at the certificate, diploma, degree and masters level. The certificate and diploma courses are internally developed while the degree and masters programmes are conducted in association with prestigious universities in Australia and the United Kingdom. KDU Penang houses more than 2,500 students who not only hail from Penang but also from neighbouring states in the northern region as well as foreign countries such as Thailand, Indonesia, Korea, China, Mongolia and Japan.

132 Open University Malaysia (OUM), established by Multimedia Technology Enhancement Operations (METEOR) Sdn. Bhd., is a consortium of 11 public universities in the country aiming to provide open and distance education to the masses. It is specifically targeted at working adults who need to take care of their families as well as manage their careers while pursuing higher education. OUM's strengths span a wide range of disciplines, from information technology and engineering to the arts and social sciences (science and business). Nationwide, OUM has over 79,000 students in 70 academic programmes and is in its eighth year of operation. It has 53 learning centres nationwide and they are managed by a team of administrators. The centres are fully equipped with tutorial rooms, computer laboratories, libraries and internet facilities. Through OUM, working adults can upgrade their knowledge and skills for the purpose of career progression and transition or pursuing lifelong learning ambitions, all within the comfort of their homes.

133 Wawasan Open University (WOU) is Malaysia's first private, not-for-profit, open learning institution and a lifelong learning community without borders. Its self-paced learning environment is specially designed for the convenience and accessibility of adult learners of any age, gender, ethnic

group or background. It is funded by charitable trusts, corporations and the public to lower the personal cost of learning, and thus making it more affordable.

134 Equator Academy of Art is 20 years old and is the leading art and design college located in Penang. Equator is renowned for providing art and design enthusiasts with quality education, specialist knowledge and professional skills. All its courses are approved by the Ministry of Higher Education and accredited by MQA with full recognition.

2.4.2 Corporatisation of Universiti Sains Malaysia: A Strategic Response to Market Forces

135 Universiti Sains Malaysia implements duties and responsibilities in line with the government's objectives and aspirations. In mapping out Universiti Sains Malaysia's strategic responses to globalisation, the leadership ability of the vice chancellor has been instrumental in steering the direction of the university and encouraging staff to produce equally strategic initiatives in upgrading quality of instruction and research at a global and international level. When Universiti Sains Malaysia was corporatised on 15 March 1998, the commitment to achieve at an international level became its guiding principle. Throughout 1998, Universiti Sains Malaysia strived to install quality measures in its 'core business', incorporating teaching and learning, and research and development (R&D); training staff; and developing holistic graduates. At this stage, Universiti Sains Malaysia underwent a significant change in its governance structure with the replacement of its university court by an eight-member board of directors comprised of the chairperson, vice chancellor and six others (Morshidi, 2002).

136 While the university was coping with the restructuring of its governance and funding, student enrolments increased and this helped in meeting the manpower needs of the country. According to available data (Universiti Sains Malaysia, Annual Report, 2008), the average student enrolment in academic programmes in the years 1998–2001 was 19,291 students, compared to the enrolment of 27,926 students in 2007 (an increase of about 8,500 students). Table 2.7 below shows student enrolment in Universiti Sains Malaysia in the years 2005–2008, and the trend between 2005 and 2008 are graphically presented in Figures 2.12 and 2.13.

Table 2.9 Student enrolment in Universiti Sains Malaysia according to level of study, 2005–2008

Level	2005	2006	2007	2008
Bachelor's degree (full-time)	18,541	17,940	16,610	15,088
Bachelor's degree (distance education)	4,728	5,183	5,365	5,653
Master's degree	5,142	5,004	4,909	5,245
Doctorate degree	1,379	1,648	1,928	2,213
Non-degree study (inclusive of the student exchange scheme)	110	149	213	251
Foundation science (distance education)	24	13	1	1
Postgraduate diploma	2	59	106	50
Diploma	-	-	90	182
Total	29,926	29,996	29,222	28,683

Note: data for 2008 are based on the draft of the Universiti Sains Malaysia Annual Report, 2008

Source: Universiti Sains Malaysia, Annual Report (2007: 32)

137 From Figure 2.12, Universiti Sains Malaysia, in making strategic decisions, has been gradually reducing enrolment in its undergraduate programmes since 2005. With the attainment of the APEX

status in 2008, the focus since then has been on increasing enrolment in postgraduate research programmes. But, as indicated in Figure 2.13, Universiti Sains Malaysia is also fully committed to offering non-degree programmes meant for international students in the inter-university mobility programmes.

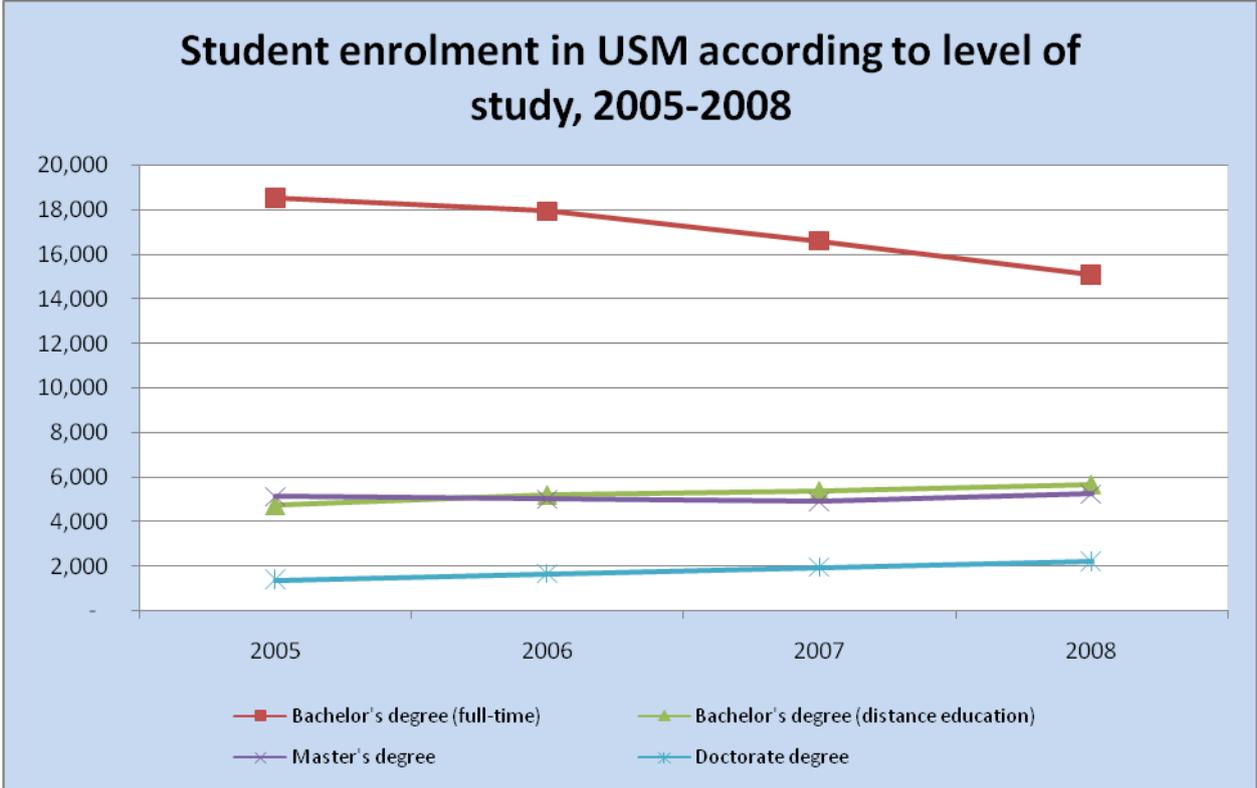


Figure 2.14. Student enrolment in Universiti Sains Malaysia according to level of study, 2005–2008

Note: data for 2008 are based on the draft of the Universiti Sains Malaysia Annual Report, 2008

Source: Universiti Sains Malaysia, Annual Report (2007: 32)

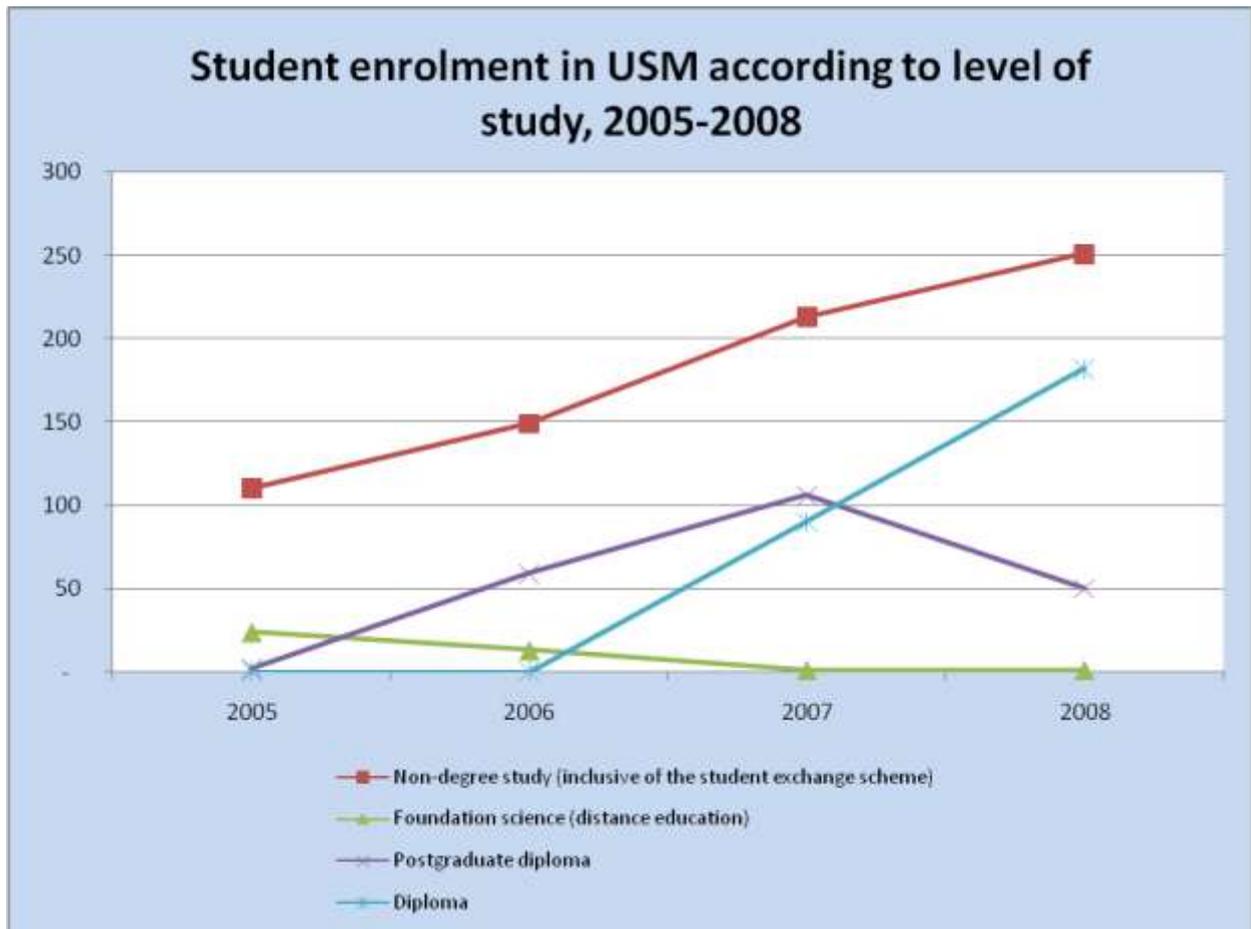


Figure 2.15. Student enrolment in Universiti Sains Malaysia according to level of study, 2005–2008

Note: data for 2008 are based on the draft of the Universiti Sains Malaysia Annual Report, 2008

Source: Universiti Sains Malaysia, Annual Report (2007: 32)

138 The enrolment of international students at various levels of study at Universiti Sains Malaysia increased from 1,326 students in 2006 to 1,610 students in 2007, signaling an approximate 21.42% increase in enrolment compared to 2006. The largest groups of international students are from Indonesia, Thailand, Yemen, Jordan, Libya, Iran, India and Palestine. The total graduate output from Universiti Sains Malaysia according to a study in 2007 was 7,591 graduates (134 with PhDs, 991 with masters, 6,014 with bachelor degrees and 452 with bachelors in the external degree programmes).

139 The government of Malaysia, based on a process of selection procedures, accorded Universiti Sains Malaysia, the first APEX university status in Malaysia in September 2008. Awarding Universiti Sains Malaysia with the APEX status serves to foreground the university's past and current accomplishments:

- Accomplishments in teaching, learning, research and innovation.
- The university has built the basic infrastructure to become more competitive at the global level.
- Universiti Sains Malaysia was rated the only 'excellent' university in the Academic Reputation Survey of 2006, conducted by the MQA.
- Universiti Sains Malaysia gained recognition as the United Nation University's Regional Centre for Excellence (UNU-RCE) in 2005 on education for sustainable development.

- The university has created research programmes that are structured and organised along multi-disciplinary clusters with borderless facilities (e.g., social transformation clusters comprising the social sciences and humanities, medical health, life sciences, health sciences, engineering and technology, information technology and fundamental research).
- Since 2006, the university has been appointed as one of the four research universities by MOHE.

140 In transforming its higher education agenda, Universiti Sains Malaysia has set out to achieve the following goals: eliminate/reduce bureaucracy, resource gap and talent mismatch; raise its global agenda, autonomy, accountability, quality of services and future relevance; create ‘people-led’ local solutions; and promote sustainability in its functions. In terms of research performance, Universiti Sains Malaysia has continuously generated an upward trend in publication output as shown in Table 2.8.

Table 2.10 Quantity and quality of research at Universiti Sains Malaysia, 2004–2008

Criteria	Indicator	Year				
		2004	2005	2006	2007	*2008
Publications #	a. Total no. of publications in citation-indexed journals (including those undergoing refereed proceedings in Institutue for Scientific Information serials)	221	329	467	521	151
	b. Total no. of publications in non-citation-indexed journals	404	350	325	635	31
	c. Total no. of books authored	81	146	33	85	18
	d. Total no. of chapters in books authored	48	47	311	244	78
	e. Other publications that have created an impact on the government/policy (abstracts and articles in magazines, newsletters, etc. (not including unpublished reports))	478	414	850	1,304	15
	f. Cumulative impact factor of publications	289.08	402.32	503.16	575.19	63.30
Citations *	Total no. of citations in papers published in the Scopus-indexed Journals	659	899	1,463	1,629	555
Research grants for the science and technology academic staff	a. Total amount of public funding (from government agencies)	11,472,361	18,186,327	23,442,996	74,034,163	5,598,623
	b. Total amount of private funding (including contract research)	2,267,658	1,840,199	629,123	1,175,464	14,689,627
	c. Total amount of international funding	2,270,326	1,793,650	1,729,125	749,482	102,480
Research expenditure for research projects	a. Total amount of research grants received	20,014,252	27,724,482	28,056,775	87,101,969	21,861,238
	b. Total amount of research grants spent	31,981,380	31,006,084	24,626,344	35,081,759	11,654,570
Postdoctoral appointment	a. Number of doctoral graduates appointed	7	10	2	5	11
	• national	0	4	2	2	2
	• international	7	6	0	3	9

Note: figures for 2006–2007 are based on Universiti Sains Malaysia’s unaudited data while figures for 2008 are from January–April 2008

Source: Universiti Sains Malaysia, Annual Report (2007)

2.5 Emerging Issues

141 The Malaysian higher education scene is highly diversified with providers from the public, and private non-profit and private for-profit sector offering various programmes via innovative modes of delivery. Noticeably, the higher education landscape in Penang has changed dramatically over the years. No doubt, Universiti Sains Malaysia has been and will continue to be very dominant in many aspects. Recently, new players such as WOU are contributing positively to the growth and diversity of the education sector in many ways. However, within the said positive note, Penang recently saw a substantial reduction in the number of private colleges, and this may affect the overall vibrancy of the local education sector. Future challenges will relate to enhancing quality in these educational institutions.

142 With little or no incentives from both the federal and state authorities, local private colleges find it very difficult to sustain their operations in the highly competitive local education market. This might bring about the need for more synergistic collaboration among private college providers to ensure sustainable growth.

143 Many local private colleges are acting as feeders to parent companies/institutions in Klang Valley, and thus opportunities for them to justify expansion and investment in the present and anticipated future of the private institutions are extremely few.

144 With contractions in the local education market, particularly among international students, the future of private education institutions in Penang is highly dependent on innovative academic programmes with effective promotional campaigns from the private sector, and commitment and support from the state.

CHAPTER III: CONTRIBUTION OF RESEARCH TO REGIONAL INNOVATION³

Introduction

145 Penang is the first state in Malaysia to be awarded the Multimedia Super Corridor (MSC) Malaysia Cybercity status in 2005 and is officially known as Penang Cybercity (PCC). With the implementation of the Knowledge-Information Communication Technology (K-ICT) blueprint, Software Consortium of Penang (SCoPe), and the projected launch of Penang Cybercity 2 (PCC2) and Penang Cybercity 3 (PCC3), a high technology growth platform has been provided for industries and businesses (SERI, 2008). Through InvestPenang which is the state's total service provider, Penang aims to become a centre of excellence for knowledge and highly-skilled manpower. The strategies include attracting and retaining the world's leading multi-national corporations (MNC) and their knowledge workers, acting as a catalyst for these MNCs; and Malaysian corporations creating value-added activities and thus moving up the value chain. At the same time, InvestPenang also initiates collaboration with universities, private institutions and skills development centres to educate and prepare knowledge workers (InvestPenang, 2009).

3.1 Responding to Regional Needs and Demands

3.1.1 Regional Dimension of the Research Policy

146 The Organisation for Economic Cooperation and Development (OECD) has defined research and development (R&D) as a term covering three activities: basic research, applied research and experimental development. Innovation is defined as the implementation of a new or significantly improved product (good or service) or process, or a new marketing or organisational method in business practices, workplace organisation or external relations (OECD, 1993).

147 Universiti Sains Malaysia is one of the five universities in Malaysia that has been identified as a research-intensive university. Its mission and vision is to impact the global research landscape via strategic planning and implementation of its R&D mechanisms. Strong research areas of Universiti Sains Malaysia include environmental science, aquaculture, biomedical and pharmaceutical studies, natural language processing and computer aided translation, information technology, food technology, polymer science and technology, biotechnology, distance education, geographical information system, structure analysis, materials science, engineering, surface chemistry and robotic vision.

- In 2001, an audit on R&D activities in Universiti Sains Malaysia identified several niche areas which have reached or are on the verge of world-class standards. The top five areas were medical biotechnology, ecological drainage, vector control, anti-infective drug research and aquaculture research.
- Multi-disciplinary research clusters, which include the social transformation cluster (which comprises the social clusters and humanities), medical, life sciences, health sciences, engineering and technology, information technology and fundamental research, were implemented to increase collaboration and cooperation among researchers. A total of 1,300 research grants addressed numerous topics in clusters rather than individually.
- R&D initiatives were enforced: The Research Creativity and Management Office (RCMO) was established to provide for the R&D management, administration and implementation needs of the university.

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- Research dean positions for various research platforms — clinical, life sciences, computer, and social transformation and fundamentals — were established.
- A research endowment fund to supplement the inadequacy of grants provided by the public and private sector was initiated.
- Research incentives were expanded to include travel grants, honorariums to researchers, awards and fellowships, and sponsored participation at international conferences.
- The Division of Industry and Community Network (BJIM) was established to promote cooperation, collaboration and partnership between the two entities (Abdul Razak & Mohamed, 2008).

148 In 2006, Universiti Sains Malaysia was designated as one of the premier research intensive universities, and in 2007, it was rated a five-star university in the Academic Reputation Survey of 2006 conducted by the Malaysian Qualifications Agency (MQA). Universiti Sains Malaysia was rated as the best overall university in Malaysia for its contribution to the advancement of research in the country. Following OECD (2007) call for sustainable higher education, Universiti Sains Malaysia has set forth measures to become a sustainably-led institution of higher learning. The university aims to be prudent in its acquisition programmes and pursue good citizen type initiatives such as a green campus concept as well as to offer recognition and reward incentives to staff to encourage their involvement in sustainable leadership development in the regional community (Abdul Razak & Mohamed, 2008).

149 In addition, most of its research and innovation activities will be revamped to be more in line with the theme of sustainable development. More research projects will be realigned to the areas of health, biotechnology, molecular medicine, fundamental research, biodiversity, environment and engineering.

150 In 2008, Universiti Sains Malaysia was named Malaysia's first and only Accelerated Program for Excellence (APEX) University by the Malaysian Higher Education Ministry and is expected to achieve world-class standing within five years.

3.1.2 Research Activities of Higher Education Institutions: Drawing upon the Characteristics of the Region

151 The current global economic downturn in the aftermath of the United States-led financial crisis has significantly affected Penang's export-oriented economy. The state has taken several long-term measures to remedy the situation:

- i) moving up the electrical and electronics (E&E) value-added chain (i.e., manufacturing more technology-based, higher end or newer products such as light-emitting diodes);
- ii) diversifying the manufacturing sector for a more balanced composition between E&E and non-E&E sectors, mainly by attracting foreign direct and domestic investments in non-E&E and resilient industries such as avionics, oil- and gas- related manufacturing, and medical devices;
- iii) reviving tourism by leveraging on Penang's United Nations Educational Scientific and Cultural Organisation (UNESCO) World Heritage status and taking advantage of specific areas of comparative and competitive advantage such as medical tourism;
- iv) boosting intermediate and final services such as logistics, especially in port services, to promote the Penang port as a hub for northern Sumatra and southern Thailand, addressing public transportation issues, and promoting health and shared service centres as new sources of non-manufacturing growth;

- v) restructuring the state economy into a “knowledge-based” economy by focusing on related activities and industries such as R&D, design and development, biotechnology and education, with information and communication technology (ICT) as the key enabler, via the free wi-fi state project, and by promoting ICT-based industries such as creative multimedia software and e-solutions; and
- vi) adopting the best practices of the state government under the CAT (competency, accountability, transparency) principle and improving the public sector’s efficiency and service level (SERI, 2008).

152 These strategies are in line with the broader national and regional economic initiatives such as the Northern Corridor Economic Region (NCER) and the Indonesia-Malaysia-Thailand Growth Triangle. In addition, the strategies are also in consonance with the implementation of new major infrastructure projects and the upgrade of existing infrastructures in the state, namely, the construction of the second Penang Bridge, lane expansion of the original Penang double-tracking rail project (for the northern section), and RM250 million upgrade and expansion of the Penang International Airport.

153 Universiti Sains Malaysia as a prominent higher education institution in Penang has substantial R&D capacities in the strategic areas described above, and hence to a certain extent, the challenges related to E&E, biotechnology and ICT are particularly relevant to Universiti Sains Malaysia researches as outlined below:

- i) In E &E, School of Electrical and Electronic Engineering has 23 years of collaboration with Agilent Technologies. Agilent has donated generously for the setting up of the Universiti Sains Malaysia-Agilent Technology Instrument Laboratory.
- ii) The Universiti Sains Malaysia-Intel collaboration involves the Intel Multi-core lab with Universiti Sains Malaysia’s School of Computer Science selected as an Intel Multi-core training centre where academics are trained and exposed to the various application/software tools related to multi-core architecture.
- iii) The Intel eLite Program is another structured Intel-University programme with the aim of building up graduates’ readiness for the industries.
- iv) Intel is also collaborating with the School of Materials and Mineral Resources Engineering by funding two research projects in the area of lead-free and thermal interface materials and by developing an electronics packaging course for the M.Sc. mix-mode programme.
- v) Researchers in the School of Housing, Building and Planning are also actively involved in the fields of building conservation, urban conservation and heritage tourism for the city of George Town in Penang.
- vi) In the area of herbal research, a few researches from the School of Pharmaceutical Sciences in collaboration with the Forest Research Institute of Malaysia secured a grant of several million Ringgit under the Malaysia-Massachusetts Institute of Technology biotechnology partnership programme (1999–2004). The grant was awarded for research on *Tongkat Ali* (a prominent traditional herb in Malaysia) on its antiviral properties.
- vii) Universiti Sains Malaysia through USAINS Holding Sdn. Bhd. (the university’s commercial arm) has about 50 biotechnology scientists who are grouped into four research clusters comprising of drug formulation and delivery systems, molecular biology, clinical trials and immunochemistry. 20 biotechnology products have been commercialised so far.

- viii) Collaborations with international life science companies such as the United States-based Herbal Science which creates and patents altered chemical profiles of botanicals (products made from plants including herbs) will strengthen Penang’s move to pursue biotechnology as an engine of economic growth.
- ix) Universiti Sains Malaysia has also signed a partnership with the Malaysian Biotechnology Corporation (Biotechcorp) towards collaboration in advanced nanotechnology R&D. Under the agreement, Universiti Sains Malaysia researchers will undergo training at Nanobiotix, France to intensify R&D to improve the Malaysian biotechnology industry. The technology transfer programme will include the sharing of technical information and know-how, manufacturing techniques, engineering data, specification of materials and other privileged information proprietary to Nanobiotix of France (Biotechcorp had a previous technology transfer and license agreement with Nanobiotix where they acquired an exclusive worldwide license for a nanotechnology platform).

154 The focus area for researchers in the rapid diagnostic group in the Institute for Research in Molecular Medicine (INFORMM) in Universiti Sains Malaysia is the infectious and tropical diseases (e.g., typhoid, tuberculosis, hepatitis, filariasis and cholera) faced by the citizens of Malaysia and other countries in the region. Several products have been commercialised at national and international markets. The TYPHIDOT Kit (rapid test for typhoid) and Brugia Rapid for filariasis detection are among those commercialised products. To date, ten other products have been developed into prototypes. At present, research is concentrated on the exploitation of DNA-based technology in producing DNA dipstick kits based on nanotechnology (Universiti Sains Malaysia, 2002–2009).

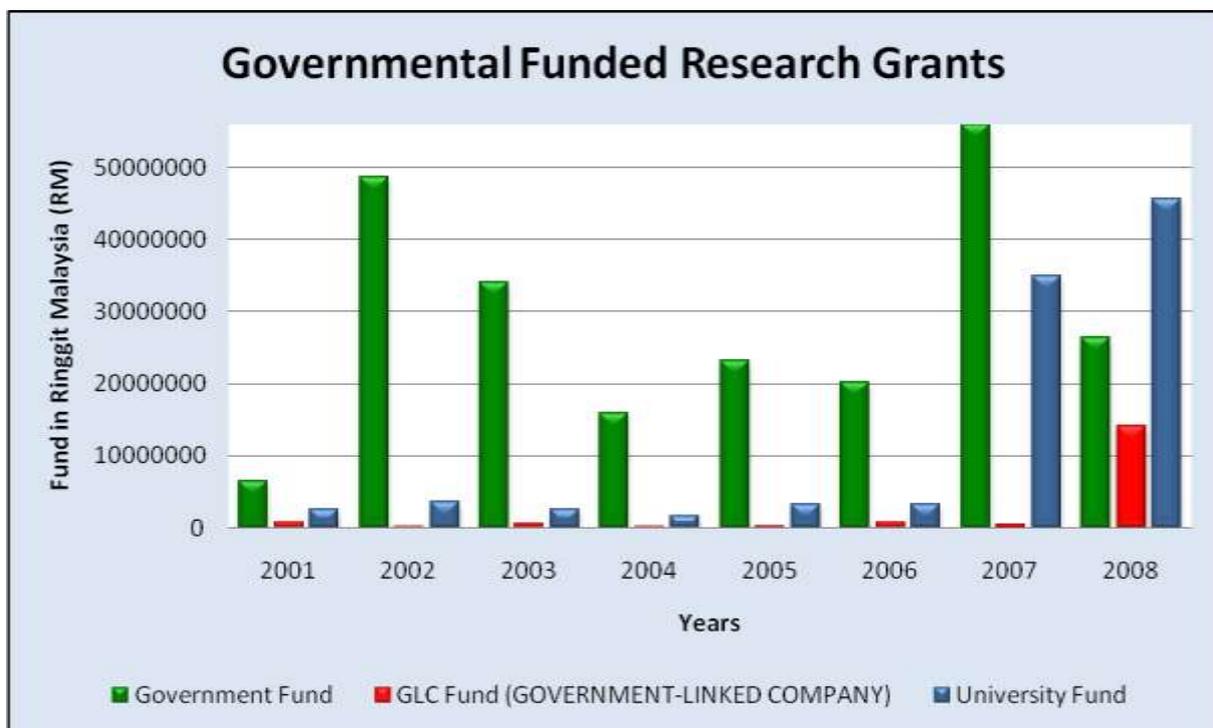


Figure 3.1. Research funds received by Universiti Sains Malaysia from the Malaysian government, 2001–2008

Source: RCMO, Universiti Sains Malaysia (2010)

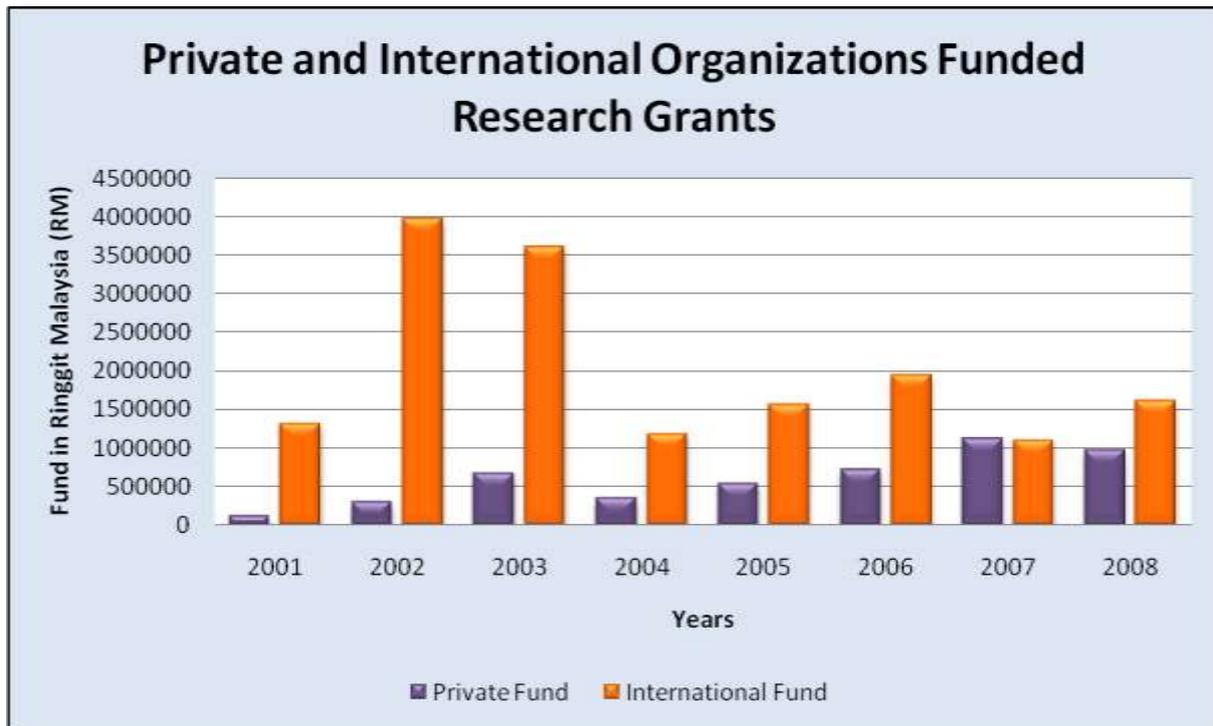


Figure 3.2. Research funds received by Universiti Sains Malaysia from private companies and international organisations, 2001–2008

Source: RCMO, Universiti Sains Malaysia (2010)

3.1.3 Research Links with Other Regions

155 The Penang Development Corporation (PDC) is the state’s principal development agency and has been actively involved in Penang’s industrialisation process by way of promoting, directing and undertaking the industrial development programme. Currently, this corporation’s focus is to attract more foreign investment, encourage reinvestment, upgrade the local support industry, foster a highly skilled workforce and strengthen Penang’s competitiveness by developing an “industry cluster” that promotes a dynamic partnership between the government and industry.

156 InvestPenang, a subsidiary of PDC, has a mission to revive and further promote business investments in the state of Penang. It envisions itself as the driver of the three-pronged synergies of technology, industry and business to attain sustainable economic growth and development for the people of Penang and Malaysia. One of its strategies is to have a pool of recognised and diverse expertise in various areas, and thus enhance R&D.

157 In recognizing biotechnology as a promising and crucial technology not only in the field of health and medicine but also in protecting the environment and increasing food production, the Penang government has launched a biotechnology initiative to attract investment and research activities encompassing marine biotechnology, bio-ICT development and biotech education. Recently, InvestPenang commissioned Universiti Sains Malaysia to produce a strategic roadmap for the development of biopharmaceutical research and industry in the northern region (PDC, 2002). The Penang Biotech Park is situated in Bukit Minyak, Penang; it is host to two new biotech companies. The two new plants are Alpha Biologics (specialises in the production of pre-commercial scale pre-clinical trial drugs) and Progenix Sdn. Bhd. (specialises in pre-clinical R&D work).

158 Alpha Biologics was set up in 2003 with the aid of PDC and the Malaysian Industrial Development Authority (MIDA). The company will be a specialist in mammalian cell expressed peptide and antibody drugs, and the facilities used will be in full compliance with the United States Food and Drug Administration (FDA) and European Europe, Middle East and Africa (EMEA) requirements.

159 Progenix Sdn. Bhd. is an independent contract research organisation with facilities for toxicology studies which includes research on pharmaceuticals, biotechnology products, medical devices, food, agrochemicals, biocides and other chemicals. Both Alpha Biologics and Progenix Sdn. Bhd. will provide training and job opportunities for graduates in the biotech field. They will also represent a research collaboration potential for the drug discovery-related research centres/institutes in Universiti Sains Malaysia such as the Drug Research Centre, Doping Control Centre, Advance Medical and Dental Institute (AMDI) and INFORMM (Pharmaceutical-Technology.com, 2009).

Independent Research Institutes and Public Agencies

Socio-economic and Environmental Research Institute (SERI)

160 The Socio-economic and Environmental Research Institute (SERI) is the think tank for the government of Penang. It was established to carry out strategic planning and formulate policy recommendations. In this regard, SERI is mandated to conduct socio-economic and environmental studies related and relevant to the development of the state and recommend policy options that would concur with the principles of sustainable development; carry out research commissions by private and public sector clients, both local and international; conduct research and policy analysis as well as strategic planning in Penang; maintain a comprehensive databank and resource centre in order to facilitate research in the state; provide a forum for intellectual and professional exchange on critical, current and strategic issues that will have an impact on Penang's development; publish and disseminate research findings that would enrich public discourse and promote sustainable development in Penang; and provide support service for socio-economic and environmental programmes for the state government and its agencies (SERI, 1998–2008).

161 An example of a collaborative project with Universiti Sains Malaysia is the “Greening of Universiti Sains Malaysia and the hotel belt in Batu Ferringhi”. The project explored environmentally safe organic waste treatment with emphasis towards resource recovery and eco-circulation which is part of the state's ongoing efforts to minimize waste generation and disposal of Penang. The project is funded by the Asian Productivity Organisation based in Japan (SERI, 1998-2008).

Fisheries Research Institute (FRI)

162 The Fisheries Research Institute (FRI) is under the purview of the research division of the Department of Fisheries Malaysia. This institute aims to be the centre of excellence for tropical fisheries research and contribute scientifically to the sustainable development of the fisheries sector.

163 FRI has been collaborating actively with local as well as foreign higher education institutes. An example of collaboration with local universities is the project on integrating biotechnological and breeding approaches for the genetic enhancement of the *Keli Bunga*, *Clarius macrocephalus*. This project undertaken with Universiti Sains Malaysia was funded by the Ministry of Science, Technology and Innovation Malaysia (MOSTI) (FRI, 2005–2008).

Institute of Pharmaceuticals and Nutraceuticals Malaysia (IPHARM)

164 The Institute of Pharmaceuticals and Nutraceuticals Malaysia (IPHARM) is within the domain of MOSTI. IPHARM is a multi-disciplinary research institute that focuses on drug discovery and development, and aims to develop new pharmaceuticals and nutraceuticals with commercialisation potential.

165 Niche areas in pharmaceutical and nutraceutical biotechnology exploiting natural resources in Malaysia have been identified. Therefore, this institute will play a leading role in lead identification, optimization and formulation, toxicology, scaling up and pre-clinical studies. In addition, R&D efforts in fundamental research such as research on the identification and validation of targets for drug screening with local universities, specifically Universiti Sains Malaysia and other related research institutions, will be intensified.

166 Standards that comply with good laboratory practices (GLP) as implemented by the World Health Organisation (WHO) and OECD will be employed by IPHARM (IPHARM, 2008).

Research Institutes (jointly managed and funded by Universiti Sains Malaysia and federal ministries)

National Higher Education Research Institute (IPPTN) (cooperation with the Ministry of Higher Education (MOHE))

167 The National Higher Education Research Institute's (IPPTN) main focus is to develop the public and private institutions of higher learning and advance them towards achieving excellence in teaching, research and publication by undertaking relevant research. In addition, it aims to enhance and expand research efforts in all aspects of higher education including research on policies, curriculum, governance, human resources, and infrastructure (IPPTN, 2002–2009).

National Advanced Internet Protocol version 6 Centre (NAv6)

168 The National Advanced Internet Protocol version 6 Centre (NAv6) established by the Ministry of Energy, Water and Communications (MEWC) serves as the national centre for Internet Protocol version 6 (IPv6) research, human resource development and the monitoring of the IPv6 development for Malaysia. The said centre successfully developed the National IPv6 Roadmap which is the blueprint that will be used by Malaysia to implement the migration of its network to IPv6.

169 In addition, the NAv6 provides IPv6 training and consultancy, network security audits and collaboration on information technology-related R&D. The promotion of IPv6 and support of government agencies and other organisations in Malaysia have been the main focus of this centre (NAv6, 2008).

Centre for Education, Training and Research in Renewable Energy and Energy Efficiency (CETREE) (with the Ministry of Energy, Water and Communications (MEWC))

170 The Centre for Education, Training and Research in Renewable Energy and Energy Efficiency (CETREE) has successfully conducted various activities to increase awareness on renewable energy and energy efficiency. At the same time, knowledge is disseminated to the public and applied in energy learning programmes held in schools and higher learning institutions (CETREE, 2007). A nationwide baseline survey covering 2,500 respondents was conducted throughout Malaysia to gauge the public's awareness and knowledge of renewable energy and energy conservation. Results from the survey showed that although most Malaysians practise some energy saving measures, they have very minimal knowledge on the subject. To increase public awareness on energy efficiency, several booklets were

published by CETREE for the general public including “Your Guide to Energy Efficiency at Home”, “Renewable Energy: A Public Sector Initiative — Malaysia’s Fifth Fuel Option”, “Renewable Energy: A Private Sector Initiative — a Fruitful Business for a Bright Future”, “Energy Efficiency: A Public Sector Initiative — an Investment to Spur Economic Growth” and “Energy Efficiency: A Private Sector Initiative — an Opportunity to Gain Competitive Advantage”. Commercials for television and radio were also produced by CETREE to promote the stated cause.

3.1.4 Technology Transfer Offices: Regional, National and International Roles

Innovation Office

171 Universiti Sains Malaysia established the Innovation Office in 2006 which aims to manage the innovation system and collaboration with industrial partners in efforts to maximize the commercialisation of research products discovered at the university.

172 Recently, the Innovation Office, in its efforts to link up with regional and international institutions has established Innovation Exchange Malaysia Berhad (IXC), a platform for knowledge and innovation exchange at the international network level (Zainul, 2009).

USAINS Holding Sdn. Bhd.

173 The mission of USAINS Holding Sdn. Bhd. is “to function as the most effective and commercially viable organisation through which the innovative, educational and technical resources as well as related services of Universiti Sains Malaysia are optimized, made available and promoted to the community at large, locally and abroad” (USAINS, 2008: 2).

174 USAINS has an important role as the MSC incubator in the northern region of Malaysia, starting with Penang (Bayan Lepas) and Kedah (Kulim Hi-tech Park) (Abdul Razak, 2005).

Research Creativity and Management Office (RCMO)

175 Universiti Sains Malaysia’s Research Creativity and Management Office (RCMO) represents the focal point for research information, grants, university facilities, equipment and human resources. It was created to link up researchers, grant financiers and the industry. Universiti Sains Malaysia’s fully equipped research facilities and intellectual capital are being complemented by RCMO in order to push the university to become an excellent research centre in the region (RCMO, 2009).

3.1.5 Research Activity Linkages: Mechanisms

USAINS Holding Sdn. Bhd.

(see sections 3.1.2, 3.1.4 and 3.2.2)

Division of Industry and Community Network (BJIM)

176 The Division of Industry and Community Network (BJIM) was established within the Chancellery of Universiti Sains Malaysia in September 2007 to foster closer, effective, meaningful and sustainable linkages and partnerships with the industry and community. Its objectives are to further enhance and strengthen existing linkages and partnerships, and to establish new ones not only at the local and national level, but also at the regional and international level (BJIM, 2008). This is clearly stated in its vision and mission statements:

- **Vision** — “To contribute towards and lead in the sustainability of the social and economic development, advancement and transformation of the nation”
- **Mission** — “To engage closely with the industry and community, especially of the north and north eastern region of Peninsular Malaysia, in as many areas as possible so as to achieve the vision”

177 It aims to guide and lead the industry and community towards sustainable development, advancement and transformation. Possible areas of linkages and partnerships provided by BJIM include student attachment/internship/ industrial training, staff attachment/secondment, industry/community advisory panels, continuing education, facilities/equipment for hire, consultancy work, contract work/research and services, collaborative research, technology licensing/transfer, integrated flagship projects especially with the community, gifts/scholarships/endowment/chairs, alumni network, and joint ventures with the industry and community.

3.1.6 Meeting Regional Technology and Innovation Needs

178 USAINS (incorporated in 1998), the commercial arm of Universiti Sains Malaysia, is responsible for managing all of the university’s commercial activities. It markets and promotes the intellectual property of the university such as its innovative products, processes, patents, designs, copyright material and the consultancy services of Universiti Sains Malaysia’s professional staff.

179 Universiti Sains Malaysia’s capacity to promote innovation is increased by the establishment of the Innovation Office in 2006. The main aim of this office is to bridge the gap between researchers and USAINS Holding Sdn. Bhd. It will assist USAINS in commercialising Universiti Sains Malaysia’s research products, developing the Science and Arts Innovation Space (SAINS@USM), being directly involved in managing the intellectual property of Universiti Sains Malaysia, and acting as the secretariat for the Universiti Sains Malaysia delegation during exhibitions and competitions at the national and international level.

180 At the state level, InvestPenang plays an important role. InvestPenang’s primary focus is to sustain, rejuvenate and further promote the business milieu in the state of Penang through continued investments and the high technological development of its industrial sector. As an information and resource centre for all interested parties, it supports investors by networking with the Malaysian government via its agencies at the federal (national) and state (regional) level. At state level, the agencies are as follow:

- i) Penang Bumiputera Participation Unit
- ii) Small and Medium Industries Association of Penang
- iii) Small and Medium Enterprises Association (SAMENTA) (for northern Malaysia)
- iv) Standards and Industrial Research Institute of Malaysia (SIRIM) (Penang branch)
- v) Small and Medium Industries Development Corporation (SMIDEC) (Penang branch)
- vi) Penang Development Corporation (PDC)

Penang Bumiputera Participation Unit

181 The Penang Bumiputera Participation Unit is the implementing agency of the Ministry of Entrepreneur and Cooperative Development (MECD) at the state level. MECD's main objective is to develop quality and competitive *bumiputera* entrepreneurs. In this regard, this unit supports and contributes to produce more *bumiputera* entrepreneurs towards achieving the government's objective in developing a new generation of progressive Bumiputera Commercial and Industrial Community (BCIC) in Penang.

182 In line with the status of Penang Cyber City (PCC), PDC has implemented the Technopreneur Academy Program (TAP) with the cooperation of MECD together with the Multimedia Development Corporation (MDeC).

183 This programme is financed by MECD primarily to improve the *bumiputera* participation in ICT and subsequently overcome unemployment among *bumiputera* ICT graduates.

184 Besides that, PDC has also launched the PCC Incubator. This programme was implemented with the cooperation of Universiti Sains Malaysia, MDeC, the Bumiputera Participation Division and Majlis Amanah Rakyat (MARA). This programme is an effective method to create MSC status *bumiputera* technopreneurs through creating entrepreneurs at a basic and new level, and converting entrepreneurs from other industries who are interested in ICT.

185 PDC has also established entrepreneur development section which provides support services for the following:

- product promotion and marketing
- *Gerak Usahawan* (Entrepreneurship Movement) Showcase
- One Village One Product (OVOP) Showcase
- business premises
- homegrown training programmes
- mentor mentee programmes (in craft and ceramic)
- tailoring vendor programmes
- Penang Cybercity (PCC) Incubator Program
- Agrobases Program
- Ministry-driven Training Program
- Young Entrepreneur Program
- Entrepreneur Pioneer Program
- Technopreneur Academy Program (TAP)
- business developments
- Franchise Program (PDC, 2002)

Penang Skills Development Centre (PSDC)

186 The Penang Skills Development Centre (PSDC) was established in 1989 and is the pioneer tripartite, industry-led skills training and education centre in Malaysia. Since its inception, PSDC has grown to become the premier (skills) learning institution in Malaysia, dedicated to meeting the immediate human resource needs of the business community, and supporting and strengthening business requirements. PSDC has been awarded the best training provider in Malaysia twice by the Ministry of Human Resources and has attained both national and international recognition as a truly successful model of shared learning and a model institution for human resource development. It is the preferred one-stop human resource development entity geared towards the promotion of shared learning among

the manufacturing and service industry, which will make them globally competitive. PSDC provides proactive human resource development initiatives to companies. In line with its commitment to support the development of small and medium enterprises (SME) in Malaysia, PSDC remains dedicated in its objective to provide quality training programmes for the SMEs. This centre conducts various training programmes which are specially tailored to support the development and growth of the local SMEs in Malaysia (PSDC, 2000).

Small and Medium Industries Association of Penang

187 The Small and Medium Industries Association of Penang was created to transform small and medium industries (SMI) and SMEs that are based in the northern region of Malaysia into dependable, robust and reliable economic drivers of the country by year 2020. The association helps to instill the SMIs and SMEs of the northern region of Malaysia with the desire to upgrade themselves in order to increase the quality of their products, improve the productivity of their factors of production and lower the costs of their businesses. In realizing this, the association advocates the interests and needs of the small and medium scale industries by improving the efficiency, effectiveness, productivity and performance of firms through series of well-planned resource development programmes and road shows.

188 For instance, the association launched the SME100 Awards in 2009. The association, in collaboration with USAINS Sdn. Bhd. (wholly owned by Universiti Sains Malaysia and the International Entrepreneurs Association of the United Kingdom (IEAUK)), has also launched part-time education programmes for working adults in Malaysia. Through these programmes, professional training providers provide opportunity for working adults and entrepreneurs to be examined and earn local and international professional certificates and qualifications. The programmes offered are developed by qualified and approved practitioners in the respective fields to ensure that the students are well equipped with the skills and knowledge needed to succeed in a competitive environment.

189 Apart from this, the Training and Development Program has been organised by MIRC Incubator Sdn. Bhd. in collaboration with SAMENTA of Penang. This programme includes developing strategic marketing plans and marketing management skills, relationship selling and entrepreneurship (SMI, 2008).

Small and Medium Enterprises Association (SAMENTA)

190 The Small and Medium Enterprises Association (SAMENTA) was founded in early 1987 by a group of local entrepreneurs to represent the interests of the SMEs. The main objective of the association is assisting, promoting and developing the SMEs located in the northern region of the Peninsular of Malaysia.

191 SAMENTA caters to a wide spectrum of enterprises ranging from medium-sized, hi-tech and precision-oriented manufacturing corporations to small-sized food processing cottage industries, and from service-oriented companies to those involved in trading activities.

192 SAMENTA's main role is to act as an information provider and disseminator. The association brings up issues or problems faced by SMIs to the relevant authorities and provide a platform for its members to market their products and services among themselves, thereby creating a network among the SMIs in northern Malaysia. SAMENTA also provides members with the opportunity to share and discuss business experiences or opportunities and thus, generate interest, growth and knowledge among its members. SAMENTA is also represented in several key public and private sector committees which formulate plans and recommendations for the development and promotion of SMEs (SAMENTA, 2006).

Standards and Industrial Research Institute of Malaysia (SIRIM) (Penang branch)

193 The Standards and Industrial Research Institute of Malaysia (SIRIM) was registered on 15 November 1995 and was in full operation as a corporate entity on 1 September 1996. Since then, it has played a significant role as the national agency for industrial development. SIRIM Bhd. is a wholly owned company of the Malaysian government under the Ministry of Finance Incorporated.

194 In line with the 9th Malaysian Plan's main thrust areas, SIRIM Bhd. continues to enhance its role in industry development by becoming a partner to the industry through research, technology transfer and incubation, and skills development. SIRIM focuses on developing new technology to enable industries to move up the value chain (i.e., assisting industries to solve technical problems and discovering technology that will help industries to reinvent their products and businesses). SIRIM also aims to promote the development of new sources for SMEs to tap into and collaborate with SIRIM in the quest for growth in the manufacturing, technology and service sectors. This is in line with SIRIM Bhd.'s objective to set the foundation for the second phase towards Vision 2020 and to become a key player in the broadening of Malaysia's knowledge-based economy. Together with its industry partners, SIRIM Bhd. has enabled Malaysian products and services to receive the global recognition of quality and innovation (SIRIM, 2007).

Small and Medium Industries Development Corporation (SMIDEC)

195 Small and Medium Industries Development Corporation (SMIDEC) was established in 1996 to recognise the need for a specialised agency to further promote the development of SMIs in the manufacturing sector. This is done through the provision of advisory services, fiscal and financial assistance, infrastructural facilities, market access and other support programmes. SMIDEC aims to create efficient SMEs that can produce high value-added parts, components and finished products. SMIDEC's mission is to help SMEs become competitive and resilient, and be fully integrated in the manufacturing and service sector. In particular, SMIDEC provides technical and advisory support services in collaboration with other related agencies involved in SME development through the SME Development Program, SME Information and Advisory Centre and SME Expert Advisory Panel (SEAP).

196 SMIDEC coordinates the development of SMEs through promotional activities, the establishment of regional offices, conducting of related studies and collation of information into a comprehensive database. It also forges industrial linkages between SMEs and large companies or MNCs through the Industrial Linkage Program and Global Supplier Program. Fiscal assistance is also provided in the form of soft loans and grants as well as venture capital and equity financing. Besides that, SMIDEC also collaborates with other local and international SME-related agencies to develop SMEs through various programmes:

- i) participation in international and regional cooperation meetings and forums,
- ii) provision of skills enhancement programmes for employees of SMEs, and
- iii) placement of foreign experts in selected SMEs.

3.1.7 Rewarding and Acknowledging Regionally-based Research: Mechanisms

197 Universiti Sains Malaysia has several mechanisms for rewarding and acknowledging regionally-based research. The "Kampus Sejahtera" (Healthy Campus) Program which is based on the "University in a Garden" concept supports any activity or project that propagates the pursuit of a sustainable campus. Students and staff are empowered to solve particular university problems in order to improve

the quality of life of the campus community and environment. 20 monographs on projects ranging from transport to food, plants and worms have been produced. The solutions identified through these projects will be adopted as the university's policy if found suitable.

198 The Going Bananas project is an attempt by Universiti Sains Malaysia to use its transdisciplinary R&D projects to benefit the community and environment. The project, initiated in 2007 which is financed by the Suruhanjaya Koperasi Malaysia, attempts to recycle the whole banana tree into products such paper which can be used for writing or other decorative purposes such as lamp shades and lanterns. Discussions initiated by Universiti Sains Malaysia's Innovation Office are ongoing between the parties involved — Universiti Sains Malaysia and Kampung Perlis (a village situated close to the campus) — to explore opportunities in establishing collaborative efforts in relation to the "Banana Flour" and "Banana Tissue Culture" projects. The projects have brought together researchers from various disciplines in Universiti Sains Malaysia such as industrial technology, the arts, humanities and social sciences. The incentives for researchers are given in the form of appropriate royalties and equity ownerships in the entities involved.

199 Another example is the Worm Composting project which has been used by a community in the northern region of Malaysia to turn wastes (from paddy, cow dung and general wastes) from the village into valuable, ready-to-market chemical-free compost. The Sanggar Sanjung is another mechanism to reward and acknowledge researchers. The event is a special ceremony held to celebrate outstanding contributions of the Universiti Sains Malaysia staff and Academic Staff Training Scheme (ASTS) fellows in research, publication, quality, creativity and teaching. The event also acknowledges those who have received awards and accolades from both national and international agencies for their efforts and achievements.

200 The term "Sanggar Sanjung" means the "Hall of Fame" and it was initially proposed in year 2000; it began in 2001. The university now holds the Sanggar Sanjung Award Gala Night on an annual basis, normally at the beginning of the year.

3.2 Framework Conditions for Promoting Research and Innovation

3.2.1 Introduction

201 Intellectual property protection in Malaysia consists of patents, trademarks, industrial designs, copyrights, geographical indications and layout designs of integrated circuits. While the general objective is to provide intellectual property protection consistent with international practices in the interest of trade, there also operational objectives:

- i) to monitor intellectual property development at national and international levels, and formulate policies,
- ii) to encourage inventiveness, innovation and creativity through appropriate legislations, and
- iii) to promote the research, development and dissemination of intellectual property and technology information through the intellectual information network.

202 The intellectual property acts (e.g., the Patents Act, Trademark Act and Copyright Act) cover all innovation resulting from research work, and as most research efforts come from higher education institutions, there is therefore an indirect link between the intellectual property law and higher education institutions. For the list of international patents filed by Universiti Sains Malaysia as at April 2010, please refer to Annex A of the report.

203 The Patents Act and Copyright Act state that any innovation that arises from research work conducted by any government bodies and public institutes shall always belong to the government of Malaysia. This led to increased attention towards innovation and commercialisation on the part of the government. As for the higher education institutions, several systems were put in place to safeguard their commercial interest and stimulate innovation among staff and students.

204 There are a number of incentives provided by the government to encourage cooperation between researchers or innovators and the industry:

- i. providing appropriate royalties,
- ii. providing equity ownership in entities that commercialise R&D findings,
- iii. providing flexibility to undertake research with the industry, and
- iv. extending the services of staff after compulsory retirement based on needs.

203 For the industry, the incentives for taking up the commercialisation of local R&D findings are as follow:

- i) granting of tax deductions equivalent to actual investments for a locally owned company which invests and owns at least 70% equity of the firm, and
- ii) granting of the pioneer status with a 100% exemption for ten years to a company that undertakes the commercialisation projects.

205 The barrier in the higher education institution-industry relationship comes from the traditional mindset of both sides. Academics feel that in order to preserve their academic integrity, they need to conduct high quality research within their research areas. Those in the industry on the other hand, perceive that the research done by academics have very little application in the industry. This mindset is slowly and gradually being challenged as both sides have begun to recognise the need to collaborate and interact (Rahim & Said, 2007).

3.2.2 National Legal Framework for Research and Innovation in Higher Education Institutions

206 Universiti Sains Malaysia has long acknowledged that strategic alliance with the industry (both the larger enterprises and SMEs) is an important approach that could complement the national innovation system. This is in response to the economic demands faced by the nation and in accordance to the blueprints from the Malaysian Ministry of Education (2001–2010) (Kementerian Pendidikan Malaysia, 2001), Knowledge-based Economy Masterplan (ISIS, 2002) and National Higher Education Strategic Plan, 2020. The Universiti Sains Malaysia strategies or initiatives in building a closer working relationship with the industry are described in Table 3.1.

207 Universiti Sains Malaysia believes that in order to facilitate further growth of R&D and knowledge transfer between researchers and the industry, the usual innovation nexus of R-D-C has to be extended to include the additional elements of E for enterprise and P for Innovation Park (R-D-C-E chart-Figure 3.3 refers). The recently established Innovation Office will be the main champion in preparing innovative products from the university for commercialisation by linking up the researchers with industrial collaborators. In addition, the flow from R&D to the commercialisation of end products and the setting up of spin-off companies are envisioned to take place in an innovation park or the science park known as SAINS@USM. The SAINS@USM Space or Science and Arts Innovation Space (described in Section 3.3. 1) is created to enable entrepreneurs, investors, scientists and artists to blend their respective fields in a sustainable environment.

Table 3.1 Universiti Sains Malaysia initiatives in fostering a healthy university-industry partnership

Universiti Sains Malaysia Initiative	Function
USAINS Holding Sdn. Bhd.	Commercial arm of Universiti Sains Malaysia, incorporated in 1998
	Manages/Administers/Outsources projects
	Markets and promotes the intellectual property of Universiti Sains Malaysia
Division of Industry and Community Network (BJIM)	One-stop referral centre for the industry and community (set up in 2007)
	Coordinates linkages and partnerships with the industry and community at local, national, regional and international levels
	Provides information on the expertise, facilities and resources available at Universiti Sains Malaysia
	Provides information on new inventions, innovations, technologies and activities in Universiti Sains Malaysia
Innovation Office	Established in 2006
	Assists in the commercialisation of Universiti Sains Malaysia's research products
	Manages Universiti Sains Malaysia's intellectual property
	Aids in bridging the gap between researchers and USAINS Holding Sdn. Bhd.
	Develops the Science and Arts Innovation Space (SAINS@USM)
Research Creativity and Management Office (RCMO)	Incepted in 2002
	One-stop centre and prime mover for all research activities of Universiti Sains Malaysia
	Secretariat for new R-D-C-E initiatives (see Figure 3.3)

Source: Abdul Razak & Mohamed (2008)

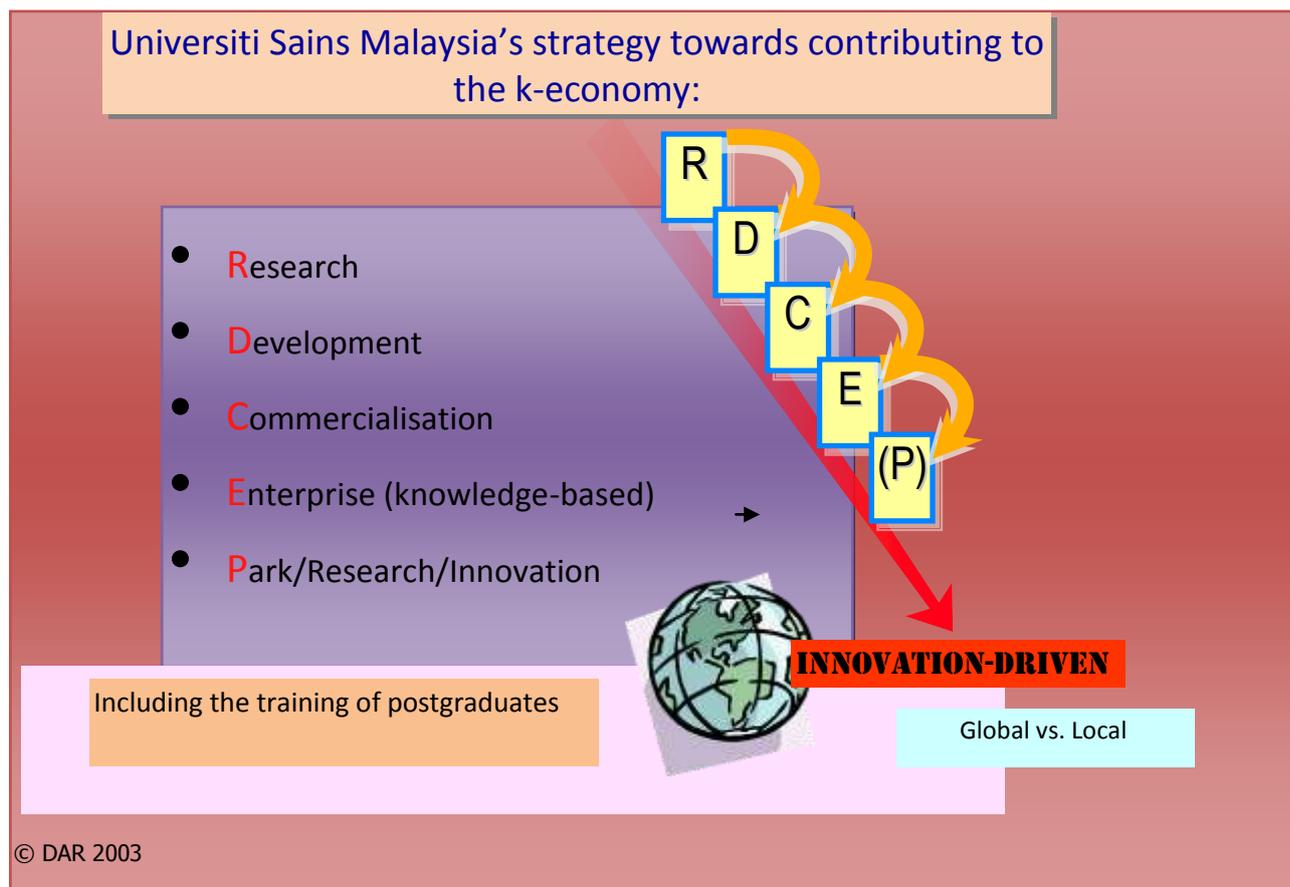


Figure 3.3. R-D-C-E chart

Source: Abdul Razak & Mohamed (2008)

3.2.3 Policies or Funding Programmes to Encourage Cooperative Research or Staff Mobility between Higher Education Institutions, the Industry and Public Organisations

208 According to the 9th Malaysian Plan, a sum of RM1.4 billion was contributed to R&D during the 8th Malaysian Plan period in order to stimulate private sector R&D. The grants available were for R&D and commercialisation purposes.

Research and Development (R&D) Grants

- *Intensification of Research in Priority Areas (IRPA) Programme*

The Intensification of Research in Priority Areas (IRPA) grant is from MOSTI to ensure more competent execution of research projects.

- *Scientific Advancement Grant Allocation (SAGA)*

The Scientific Advancement Grant Allocation (SAGA) funds researchers to work on basic research for capacity building and knowledge advancement in the fundamental sciences.

- *Industrial Research and Development Grant Scheme (IGS)*

The Industrial Research and Development Grant Scheme (IGS) was created to support the usage and adoption of existing technologies or the creation of new technologies by local companies in key

technology areas: biotechnology, advance manufacturing, advanced materials, automotive, information technology and multimedia, electronics, energy, and aerospace.

- *Multimedia Super Corridor Research and Development Grant Scheme (MGS)*
- The Multimedia Super Corridor Research and Development Grant Scheme (MGS) provides grants to encourage R &D in multimedia products and services amongst MSC-status firms with at least 51% Malaysian ownership.
- *Demonstrator Application Grant Scheme (DAGS)*

The Demonstrator Application Grant Scheme (DAGS) provides grants for projects that give opportunities for acculturation of Malaysians into ICT-based and -related activities (Economic Planning Unit, 2006).

- *Technology Acquisition Fund (TAF)*

The Technology Acquisition Fund (TAF) managed by the Malaysian Technology Development Corporation (MTDC) assists companies in obtaining strategic foreign technologies for further development (MTDC, 2009).

Commercialisation Grants

- *Commercialisation of Research and Development Fund (CRDF)*

The Commercialisation of Research and Development Fund (CRDF) is managed by the MTDC. This funding is to increase the commercialisation of science technology and innovation (STI) products and processes developed by local universities, research institutions and companies. Commercialisation of the R&D done by the above institutions will enable wealth creation and increase the technology content of SMEs (MTDC, 2009).

- *Cradle Investment Program (CIP)*

The Cradle Investment Program (CIP) links the entrepreneur with alternate sources of funding and market access for their products and services. It is managed by Cradle Fund Sdn. Bhd. to support aspiring entrepreneurs to design, innovate and market their products as well as services (Biotechcorp, 2008).

- *Biotechnology Commercialisation Grant*

The Biotechnology Commercialisation Grant is managed by Biotechcorp. It provides funding for bio-entrepreneurs (in public institutions and private companies) to commercialise viable biotechnology products and services (Biotechcorp, 2008).

- *Techno Fund*

The Techno Fund is funded by MOSTI for researchers to develop and commercialise state of the art technologies in agriculture, biotechnology, ICT and others (Abdul Razak & Mohamed, 2008).

3.3 Interfaces Facilitating Knowledge Exploitation and Exchange

3.3.1 Developing to Commercialise the Research Base of the Higher Education Sector and to Promote Technology Exchange between Higher Education Institutions and Regional Stakeholders: Mechanisms

Research Contracts, Collaboration and Consultancy

209 The important mechanisms for technology transfer between higher education institutions and regional stakeholders are joint research activities, consultancy and student projects (see section 3.1.1). Collaboration or contracts are also initiated by InvestPenang or PDC. Funding mechanisms like the Cradle Fund ensures more profit to be gained by collaboration with researchers from higher education institutions.

Intellectual Property Transactions

210 Innovation Office is the main custodian in managing Universiti Sains Malaysia's intellectual property to correspond with the university's intellectual property policy. It is responsible for intellectual property and technology transfer services, and research and training (in intellectual property and intellectual property-related issues). There are legal advisers who can offer assistance in contract negotiations and intellectual property issues (e.g., intellectual property development and protection of intellectual property exploitation).

Promotion of Incubators, Science Parks and Clusters, and Spin-offs

Science and Arts Innovation Space (SAINS@USM)

211 The *Science and Arts Innovation Space (SAINS@USM)* is a research and business development integrated community centre. The purpose of developing SAINS@USM is to represent an innovative space that promotes integrated research with incubators and collaborated laboratories as platforms to nurture transdisciplinarity. It is seen as a new idea factory driven by the spirit of innovation and entrepreneurship, as well as endowed with the wisdom of nature. The centre is supported by its own facilities and experts as well as by the nearby Universiti Sains Malaysia campus. It also has support components from the other two campuses (health and engineering).

212 To this end, SAINS@USM does not only represent the ideal space for academics and businesses to thrive, but also reaches out to the communities near and far, local and global in a truly comprehensive and holistic manner. It also strives to maintain a constant balance that promotes sustainability as one of its core values and places humanity at the top of the value chain. The ultimate goal will be to meet and address the needs of those billions at the bottom of the wealth pyramid by synergizing creativity and nurturing enterprises.

The following are the components of SAINS@USM:

- i) Bukit Jambul — provides an integrated community for incubation, nurturing and business development,
- ii) SAINS@USM satellites (selected existing Universiti Sains Malaysia units and centres of excellence located in its four campuses) — provide supporting facilities and expertise,
- iii) SAINS@USM partners — assist in collaborating research organisations anywhere in the world (future plans),

- iv) SAINS@USM Business Park — provides commercialisation space for graduating incubators and others, and
- v) Penang Science/Biotech Park — the state science research park.

212 In relation to spin-offs, Univerisiti Sains Malaysia has set up a number of such firms in relation to its research efforts. Table 3.2 below presents the spin-off companies that have been and will be set up in the near future:

Table 3.2 Spin-off companies set up by University Sains Malaysia

Spin-offs Company	Established
Malaysian Bio-Diagnostics Research Sdn. Bhd.	1994
Mlabs Systems Bhd.	1996
INetmon Sdn. Bhd.	1994
EQ-USAINS (USAINS Holding Sdn. Bhd.)	2000
IXC Malaysia Bhd.	2009
Innogredients Sdn. Bhd.	2009
InnoMaterial Sdn. Bhd.	-
Cool Return Sdn. Bhd.	-

Source: RCMO (2010)

213 SAINS@USM will further help Universiti Sains Malaysia in such undertakings as the above with specific business support and assistance. As previously mentioned, this innovation park is aimed at facilitating the commercialisation of research products and it is envisaged that more spin-off companies will be established to propel commercialisation activities.

Teaching/Training and Labor Mobility

214 The student internship programme or industrial training as it is previously known, is compulsory for students taking professional programmes (e.g., engineering, medicine, health, dentistry, housing, and building and planning). Industrial staff attachment under BJIM would be for one or two months (allowance would be similar to a sabbatical leave allowance). Conferences and continuing education courses are other instruments for technology transfer. Universiti Sains Malaysia also organises numerous conferences at the national and international level that are beneficial to the region.

3.3.2 Promoting Mechanisms for Interfaces between Higher Education Institutions and Stakeholders

215 Several approaches have been taken to ensure the success of promotional initiatives for commercialisation between Universiti Sains Malaysia and other regional stakeholders. Universiti Sains Malaysia, together with a few regional stakeholders (e.g., the Malaysian Invention and Design Society (MINDS) and MOHE), has been promoting these mechanisms through activities which can be placed into two categories: exhibitions and competitions.

216 Researchers who participate in these activities will have the opportunity to showcase their research products to potential business and industrial collaborators. These activities play an important role as a platform for the future prospectus in product commercialisation. In 2008, as recorded by the Innovation Office, Universiti Sains Malaysia participated in a number of international and national level exhibitions and competitions (Table 3.3).

Table 3.3 List of exhibitions and competitions participated by Universiti Sains Malaysia in 2008

No.	Exhibition/Competition	Venue	Level of Exhibition	Type of Exhibition
1.	Malaysia Technology Expo (MTE 2008)	Putra World Trade Center (PWTC), Kuala Lumpur	Local	Competition
2.	The 4th Asia Pacific Natural Product Expo 2008 (NATPRO 2008)	Putra World Trade Center (PWTC), Kuala Lumpur	Local	Participation
3.	Hannover Fair 2008	Hannover, Germany	International	Participation
4.	The National Intellectual Property Day 2008	Kuala Lumpur Convention Centre (KLCC), Kuala Lumpur	Local	Participation
5.	The 18th International Invention, Innovation, Industrial Design and Technology Exhibition (ITEX 2008)	Kuala Lumpur Convention Centre (KLCC), Kuala Lumpur	Local	Competition
6.	SMIDEX 2008	Kuala Lumpur Convention Centre (KLCC), Kuala Lumpur	Local	Participation
7.	The 8th ASEAN Science and Technology Week (ASTW 2008)	Manila, Philippines	International	Participation
8.	The 9th Malaysia International Food and Beverage Trade Fair 2008 (MIFB 2008)	Putra World Trade Center (PWTC), Kuala Lumpur	Local	Participation
9.	Malaysia Agriculture, Horticulture and Agro-tourism Show 2008 (MAHA 2008)	Malaysia Agro Exposition Park (MAEP), Serdang, Selangor	Local	Participation
10.	Bio Malaysia 2008	Kuala Lumpur Convention Centre (KLCC), Kuala Lumpur	Local	Competition
11.	Minggu Sains, Teknologi dan Inovasi 2008 (MISTI MOSTI 2008)	Dewan 2020, Kangar, Perlis	Local	Participation
12.	Inno Design Tech Expo 2008	Hong Kong Convention and Exhibition Centre, Hong Kong	International	Participation
13.	Seoul International Invention Fair (SIIF)	Seoul, Korea	International	Competition

Source: Innovation Office, Universiti Sains Malaysia (2009)

3.3.3 Roles of the Central Government, Regional Authorities, Higher Education Institutions, Regional Research Institutes and Businesses in Creating the Interface Mechanisms

217 Public, industrial and business parties should be given exposure to the mechanisms initiated by Universiti Sains Malaysia such as SAINS@USM. Since its launch in June 2008, SAINS@USM has become a trademark to Universiti Sains Malaysia. In order to make this initiative a success, the central and state governments provide capital (funding), space and consultation. Meanwhile, the regional authorities should keep its good rapport with Universiti Sains Malaysia and become an advisor to the university in the context of local economic invention prospects. SAINS@USM should be the new medium for local economic contributors in the region.

218 Promoting SAINS@USM must be given priority by Universiti Sains Malaysia and it can be managed through participation in exhibitions, road shows/tours or series of seminars. Regional research institutes such as the FRI, SIRIM, Malaysian Agricultural Research and Development Institute (MARDI) and others must also be proactive in conducting numerous research activities and acquiring research grants. Businesses and industries are also key components in the creation of SAINS@USM. They can contribute in provision of materials, services and labor/talent mobility (industrial attachment).

3.3.4 Specific Mechanisms that Have Been Created within or between Higher Education Institutions

219 In Universiti Sains Malaysia, the Innovation Office plays the same role as the Technology Liaison Office or Technology Transfer Office. Therefore, they are responsible for all activities concerning commercialisation, intellectual property and promotional events via exhibition. In addition, specific structures have been put in place to disseminate R&D and innovation to industry partners.

220 Universiti Sains Malaysia and its respective departments listed below are responsible for ensuring that the university's structures are fully utilized:

- i) The Innovation Office in Universiti Sains Malaysia is responsible for organising and participating in exhibitions and competitions. A regional web page of entry points handled by the Innovation Office will provide the latest information on exhibitions/competitions/regular demonstrations and others. The web page will also provide a record of inventions by Universiti Sains Malaysia researchers.
- ii) The Public Relations Office (PRO) is responsible for updating the latest information on R&D and innovation initiatives via Universiti Sains Malaysia's web page under the column of invention and also via the newspaper column.

3.4 Conclusion

3.4.1 Collaboration between Regional Stakeholders Related to the Contribution of Research to Regional Innovation in the Region

Collaboration between the Higher Education Institutions in the Region

221 At present, research is carried out mainly by Universiti Sains Malaysia. Other higher education institutions in the region do carry out research but to a limited extent. Hence, there is hardly any collaboration between the higher education institutions in the region in terms of research and innovation.

Collaboration with Other Regional Stakeholders

222 State government agencies that have provided research grants for Universiti Sains Malaysia from 2001 to 2008 consist of the Unit Perancang Ekonomi Negeri, FRI, Penang City Council, Penang Development Regional Authority (PERDA) and Penang Forestry Department. Industries in the region that have provided significant research funding are Intel Technology Sdn. Bhd., the Malaysia Toray Science Foundation, Invest Penang Bhd., the Agilent Technologies Foundation and Advanced Micro Devices (AMD) (RCMO, Universiti Sains Malaysia, 2010).

223 The Universiti Sains Malaysia-Industry collaboration is only limited to certain schools/areas in Universiti Sains Malaysia: E&E (quite established) and biotechnology/life sciences (still in early stages of development).

224 More should be done in leveraging George Town as a UNESCO World Heritage site. Technology Transfer Offices within Universiti Sains Malaysia should cover regional aspects as well. More reward, support and acknowledgement should be given to regionally based research.

3.4.2 Strengths, Weaknesses, Opportunities and Threats Related to the Contribution of Research to Regional Innovation in the Region

225 There are strengths, weaknesses, opportunities and threats related to the contribution of research to regional innovation in the region:

Strengths

- Establishment of internationally strong research groups in fields such as medical biotechnology, ecological drainage, vector control, anti-infective drug and aquaculture.
- Long history of collaboration with MNCs.
- Active effort by the Universiti Sains Malaysia's infrastructure/Technology Transfer Offices to promote research and innovation, and commercialise innovative products.
- Strong government support in funding and incentives for international/national research-based projects.

Weaknesses

- Lack of support in regional research development.
- Limited interaction between higher education institution researchers and the industries.
- Insufficient information exposure on R&D to the industries.

Opportunities

- Universiti Sains Malaysia's recognition as an APEX University.
- SAINS@USM as a bridge between higher education institutions, SMEs and the industries.
- The Penang Biotech Park offers potential collaboration and job opportunities.

Threats

- Research strength of higher education institutions is transferred to SMEs and the industries — loss of contract research for higher education institutions.
- Less economic incentives for R&D cooperation with the regional industries.
- Migration of knowledge workers from higher education institutions to the industries.

226 Although it is difficult to measure the real impact of all the research programmes on the Penang community, a research university such as Universiti Sains Malaysia supplies both an educated workforce and quality far-reaching R&D programmes.

227 Many of the advancements made at Universiti Sains Malaysia, while serving a global quest for knowledge, specifically reflect and respond to the needs of the region. The development of biomedical products, devices and technologies focusing on rapid diagnosis, innovative therapy, and new therapeutics and devices for diseases is very relevant to the Penang region. There are specific examples of research projects in the medical and therapeutic area: (i) Development and Production of Dense Hydroxyapatite for Bone Graft Substitutes, (ii) Development and Production of Innovative Biomaterials for the Developing Countries, and (iii) Innovative Technology for the Production of (S)-Ibuprofen.

228 Other examples of research projects are projects focused on utilizing waste products from the main industries: (i) Development and Production of Oil-Zob — A Novel and Reactive Oil Adsorbent from Various Rubber Wastes and (ii) Enzymatic Deinking as an Environmentally Friendly Solution for the Recycling of Printed Waste Papers.

229 Examples of working relationships between Universiti Sains Malaysia and the major industry players in Penang were presented in an earlier section of this chapter (Section 3.1.2).

230 Recently, research projects that have direct linkage with the needs of the industries were initiated. An example is the Lean Transformation Project involving Motorola and Universiti Sains Malaysia's School of Management (regarding team performance, stress and wellness management) and School of Engineering (a cell-manufacturing programme using multimedia) with 40 students and six students in each programme respectively. This project contributes directly to the improvement of the employee job performance and working environment at Motorola.

231 While efforts have been made to address the contribution of scientific research to the industries/communities, the university has also been involved in socio-economic research. Such research led to the poverty reduction effort by Centre for Policy Research and International Studies (CenPRIS) through a registered private trust known as Amanah Ikhtiar Malaysia (AIM) (Endeavor Trust of Malaysia). AIM functions mainly as a microfinance institution that provides small loan capital to poor citizens throughout the country.

232 Research work done as early as 1974 by University Sains Malaysia's School of Housing, Building and Planning responded well to the needs of the community and country. The research carried out was on micropolicy studies on development costs, housing standards and design layout.

233 The achievements made by Universiti Sains Malaysia with regard to R&D activities, and its direct contribution to the industries and community in the region, are prominent though more efforts are needed in terms of fostering more effective and sustainable collaboration with the private sector in the region. Areas that are still in infancy such as the biotechnology sector will need particular attention. In conjunction with the nation's aspirations to build a knowledge economy and society, higher education institutions such as Universiti Sains Malaysia will have to work closely with other private and public institutions to materialize efforts such as the SAINS@USM project and Biotech Park project (which is still at the initial stage of development). In this respect, government institutions and development authorities will have to play a proactive role in supporting the development mechanisms initiated by public higher education institutions to engage the private sectors in the region.

3.5 Emerging issues

234 There are a couple of emerging issues in regard to the discussions above. Penang targeting new growth areas such as the photovoltaic industry, halal food industry, display technologies, medical devices, biotechnology, software development as well as green technology (industries with high-technology and -knowledge content) (Penang Economic Monthly, 2009) is one of the issues. Another emerging issue is in connection to the Centre of Chemical Biology, Universiti Sains Malaysia (CCB@USM) located at SAINS@USM. It is a chemical biology research centre that was formed in 2009 to focus on molecular bioengineering and synthetic biology, natural product-based drug discovery, and structural and computational biology. The centre's primary goal is to provide economic and social benefits to those at the bottom of the global pyramid.

CHAPTER IV: CONTRIBUTION OF TEACHING AND LEARNING TO THE LABOUR MARKET AND SKILLS⁴

4.0 Introduction

235 This chapter provides an overview of the contribution of teaching and learning to the labour market and skills in the region. The first part of the chapter is a discussion on the learning process in the region. The second part is on student recruitment and regional employment. The next part of the chapter is on lifelong learning, and continuing professional development and training. This is to be followed by a section on the changing forms of educational provision and enhancing the regional learning system. This chapter will end with a conclusion.

4.1 Localising the Learning Process

4.1.1 *Regional Characteristics in Aiding Teaching and Learning*

236 Generally, higher education institutions in the region do not have courses that are specially designed to meet Penang's needs or are drawn up based on the specific characteristics of Penang. To enhance students' understanding and ensure that the course content is relevant to the local context, usually, the national rather than the regional (state) characteristics are touched upon during the teaching and learning process. Nevertheless, the nature of the industry in Penang, which is more electronic based, does encourage private higher education institutions to offer more electronic engineering programmes as compared to other engineering programmes to meet the labor needs of the local industries.

237 Nevertheless, the learning programmes at higher education institutions are tied to the state industries to reflect the regional issues through work-based learning arrangements such as industrial training, internship and practicum. Industrial training is viewed as an important strategy to expose students to real-life work situations and to equip them with the necessary skills that are relevant to the local context so that they are job ready when they graduate (Nordin, 2006). Students, particularly those from the technology and industrial-based programmes, are required to undergo industrial training relevant to their study programmes at various local industries. The length of the training depends on the type of programmes they pursue. Such training aims to provide students with long-term benefits in career development. In terms of internship, students are able to gain field experience from their internship placement at various institutions and organisations in the region. Practicum training, on the other hand, provides students with supervised field experience and allows them to apply the knowledge and skills that they have acquired into the real working environment. For instance, students from the education programme are required to undergo practicum teaching at schools that are mostly located in Penang.

238 In the process of localising learning at higher education institutions, steps are also taken to ensure that the training provided to students are relevant to the local industry and corporation needs. For instance, the Career Service Unit, which is under Universiti Sains Malaysia's Division of Student Affairs and Development, has the following responsibilities (Students Handbook, 2008/2009: 71-72):

- plan, arrange and carry out career services, and establish networking with the industry;
- plan and implement career service programmes (short courses, seminars, conferences, workshops and industrial visits);
- carry out university-industry programmes to promote and market graduates, obtain feedback, and gather information regarding graduates' job performances from their employers; and
- provide students with career information.

239 The networking established between the Career Service Unit and various local industries could help Universiti Sains Malaysia gather information on the knowledge and skills that students have acquired from the perspective of the local industries. In other words, feedback from employers will enable the institution to determine the extent to which the education and training provided to students are relevant to the local industry and market needs. As for the other higher education institutions in the region, career services are provided through the counseling unit which is largely aimed at preparing students for their career endeavours and to enhance their employment opportunities. In addition, the Division of Industry and Community Network (BJIM) established at Universiti Sains Malaysia in 2007 also engages in dialogues with the state, industry and community so as to ensure that the teaching programmes and research efforts offered by Universiti Sains Malaysia are relevant to their needs, aspirations and expectations, without sacrificing the fundamental mission of the institution (Division of Industry and Community Network, 2008).

240 Other higher education institutions in the region have also established networking with the local industries via specific divisions within their individual institutions. Examples are the Division of Research and Community Network and the Industrial Development Unit at Universiti Teknologi MARA (UiTM) Penang and INTI International College Penang respectively. However, the networking established is mainly for industrial training placement and to enhance students' employment opportunities. In other words, the liaison does not ensure that the education and training provided by the private higher education institutions are relevant to the local context as most of their academic programmes (e.g., twinning degree programmes) are similar to the ones offered by their partner universities at other regions.

241 During their course of study at higher education institutions, students learn to put in initiatives to take advantage of the business opportunities in and around the campus. In order to enhance the enterprising capacity of students, the Student Entrepreneurship Development Program was established at Universiti Sains Malaysia in 1990, with support from the Ministry of Entrepreneur and Cooperative Development. Various 'student markets' were established to enable students to conduct businesses on-campus and build linkages with local suppliers. This allows them to appreciate the Penang business environment better. Business avenues were also available at various hostels to further promote student entrepreneurship.

242 In addition, all Universiti Sains Malaysia students at the undergraduate level are required to take a compulsory course: Foundation of Entrepreneurship (WSU 101: Teras Keusahawanan). The course provides students with the knowledge and practical experience in preparing business proposals, running small scale businesses at the campus level and preparing sales reports within a semester.

243 Besides the above, Universiti Sains Malaysia also provides many other entrepreneurship courses in preparing students for the business world. Among the many examples are the Entrepreneurship Undergraduate Training (LKS), Technopreneurship Program, Small Business Management Course and Young Enterprise Program. Figure 4.1 indicates that the number of students taking the various entrepreneurship courses mentioned has steadily increased since 1995.

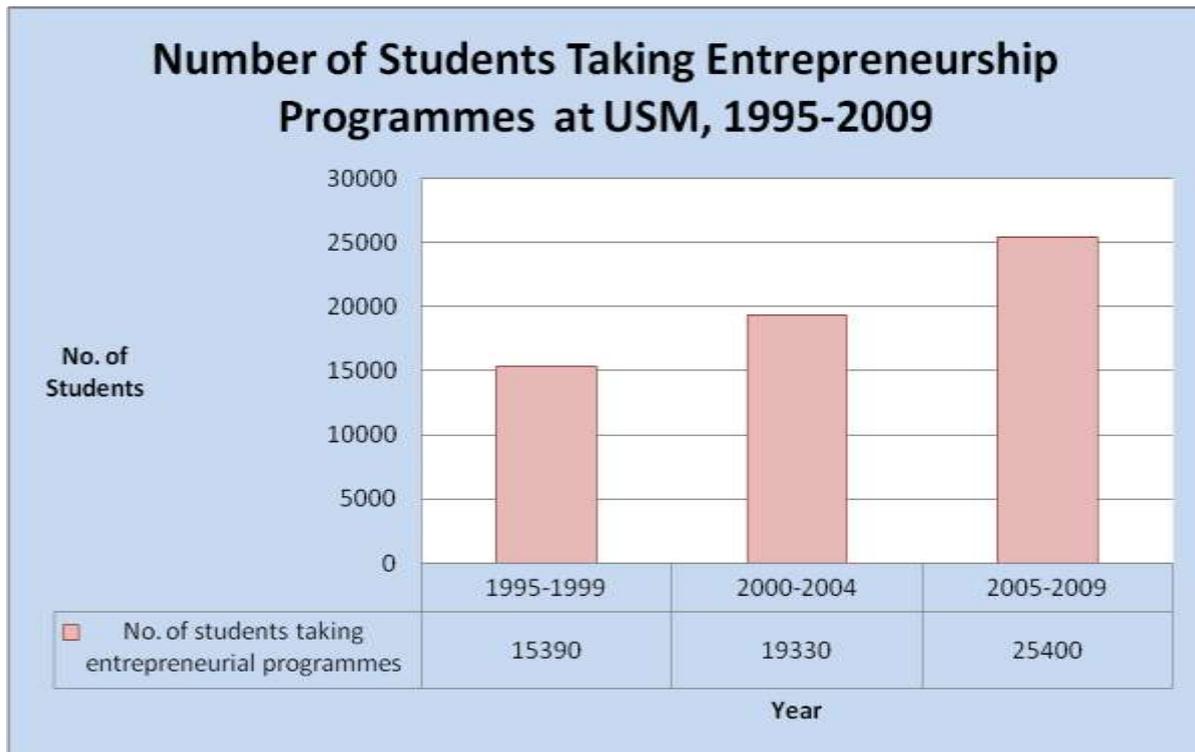


Figure 4.1. Number of students taking entrepreneurship programmes at Universiti Sains Malaysia, 1995–2009

Source: Unpublished data (from 1995 to 2009) provided by Student Affairs and Development Division, Universiti Sains Malaysia specifically Student Personality Development Section, and Centre for Curriculum Programme.

244 UiTM Penang also has a course offering which is similar to Universiti Sains Malaysia’s compulsory entrepreneurship programme. In addition, there is also an entrepreneurship initiative, *Tunas Mekar*, that enables students to be placed at small and medium enterprises (SME) for attachment and these students are later encouraged to set up their own businesses.

245 In general, the existing and forthcoming courses in public higher education institutions will create awareness among students on the business potentials in Penang which can help them reflect and tap into the opportunities available in the region. However, the private higher education institutions do not have specific entrepreneurship development courses or programmes other than the normal business programmes.

4.1.2 Student Integration in the Region

Course Placements

246 Higher education institutions in the region admit suitably qualified Malaysian citizens into their degree courses. Students come from Penang and other states in the Peninsular Malaysia as well as the states of Sarawak and Sabah in Borneo. A small number of places are allocated for foreign students. In line with the implementation of the Accelerated Program for Excellence (APEX), an effort to drive Universiti Sains Malaysia to become Malaysia's first world-class university, applications, processing, selection, offer letters, announcements and appeals are managed by the university starting from the academic year of 2009/2010. Generally, course placements at higher education institutions reflect the demographic profile of the country and are based on academic merits. Hence, students coming from various states, and different ethnicity and nationality have the opportunity to integrate and learn together. The course placement system at UiTM Penang is different. The student intake is processed by the main campus located in Shah Alam, Selangor, and only diploma courses are offered at the Penang branch. The intake of students according to the various states is shown in Figure 4.1. Majority of the students come from Selangor and are *bumiputeras*.

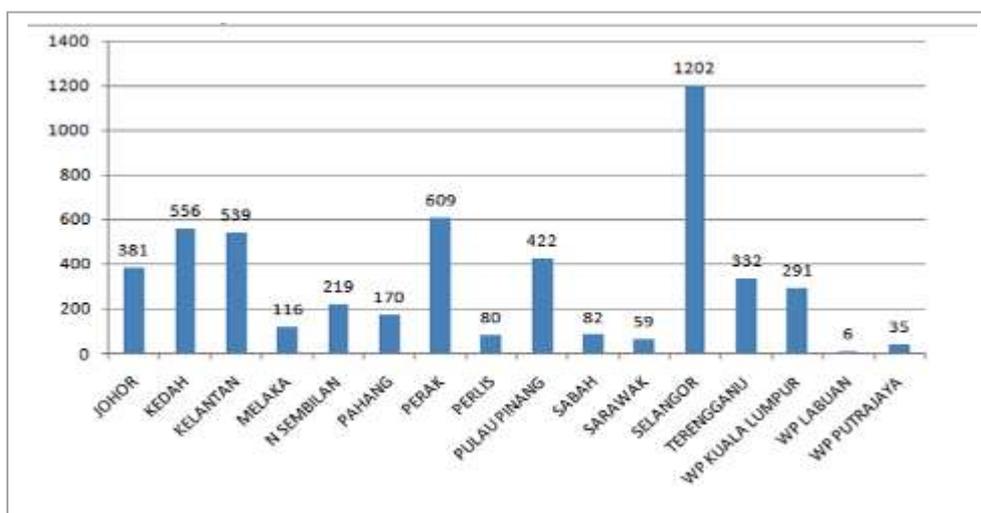


Figure 4.2. Student intake of Universiti Teknologi MARA (UiTM) (main campus) according to state

Source: Ahmad bin Ismail (2009)

247 As for private higher education institutions (INTI International College for example), student admission is based on the fulfillment of entry requirements set by the Ministry of Higher Education (MOHE) and partner universities. For INTI International College Penang, approximately 60% of the students are local students and 15% are foreign students.

Accommodation

248 Generally, students have the opportunity to integrate themselves into the local community as their campuses are mostly located at the community areas. Universiti Sains Malaysia's main campus for instance, is situated on the island of Penang, and it is just a stone's throw away from George Town, a World Heritage site (UNESCO, 2008). The campus is also near the residential, business and industrial area. In terms of accommodation, the university hostels are able to cater for approximately 70% of the undergraduate population. All first year students are eligible to stay on-campus upon acceptance into the university. Depending on vacancies, some of the rooms may be assigned to postgraduate students

(Institute of Postgraduate Studies, 2009). The remaining students stay off-campus in the neighboring housing areas. These students have greater opportunities to interact with the local communities. Their welfare is monitored by the Association of Students without Hostel (Persatuan Pelajar Tanpa Asrama (PETAS)), founded in December 2001. As for other higher education institutions in the region, the number of students staying off-campus ranges from 10% to 50%, depending on the capacity of the in-campus accommodation provided by each institution. Overall, students' engagement with the local community is still limited, particularly those of students from private higher education institutions. Interactions that students have with the local community are mainly through activities organised by the associations or clubs of the higher education institutions, and they are regulated and monitored by the institutions.

Volunteer Activities

249 Students are encouraged to participate in volunteer and welfare activities through clubs or associations (e.g., the Welfare Club/Association and Community Service Program). The Student Volunteering Team, under the Division of Student Affairs and Development in Universiti Sains Malaysia for instance, was founded in 2004. The team coordinates all forms of volunteer activities, particularly at campus, regional and national levels. Similar volunteer activities are also carried out by other higher education institutions in the region. Table 4.1 lists the volunteer activities carried out by students from Universiti Sains Malaysia at the regional level from 2008 to 2009. However, some institutions indicate that their students prefer to be involved in volunteer activities outside the region of Penang to gain additional experience.

Table 4.1 Volunteer activities carried out by students of Universiti Sains Malaysia, 2008-2009

No.	Volunteer Activity	No. of Students Involved	Location in Penang
1.	Search campaign “Where are You Little Sharline” (Di Mana Adik Sharlinie)	80	Juru, Butterworth, Bayan Baru
2.	Matriculation Resilience Program (Program Jati Diri Matrikulasi)	120	Seberang Perai
3.	Donation Colletion for Tommy (Program Pengutipan Derma untuk Tomy)	23	Around Penang
4.	Permatang Kerai Kecil Village Project (Baktisiswa Daya Wawasan Kampung Permatang Kerai Kecil)	30	Seberang Perai
5.	Rakan Muda Village Program (Program Rakan Muda Wawasan Desa Institut Pengajian Tinggi)	240	Around Penang
6.	Higher Education Convention	250	Universiti Sains Malaysia, George Town
7.	White Coffin Campaign	150	Bukit Gambir, Sungai Dua
8.	One Day without Transport Campaign	30	Universiti Sains Malaysia, George Town
9.	Blood Donation Campaign	50	Universiti Sains Malaysia, George Town
10.	Community Service Project	30	Around Penang
11.	Motivation Camp	100	Sungai Nibong
12.	Flood Assistance	500	Flooded areas in Penang
13.	Aidilfitri Celebration with the Orphans	24	Balik Pulau
14.	Daafur Fund	500	Universiti Sains Malaysia, George Town
15.	Donation for the Palestinian Victims	50	Universiti Sains Malaysia, George Town
16.	HIV/AIDS Learning Network Program	10	Around Penang
17.	Visits to the orphanage	31	Balik Pulau
18.	Charity Run	80	Batu Uban
19.	Motivation programmes and school visits	50	Universiti Sains Malaysia, George Town
20.	English is Fun	50	Sri Relau
21.	Motivation Program (Bersama Mu)	23	Batu Kawan
22.	Rakan Muda Trainer Program	5	Teluk Bahang
23.	Motivation programme for students (taking their Ujian Penilaian Sekolah Rendah)	50	Universiti Sains Malaysia, George Town
24.	Kampung Seronok Projek	40	Bayan Lepas

Note: Data above are dated January 2008 to May 2009

Source: Division of Student Affairs and Development (2009)

4.1.3 Mechanisms to Monitor/Accredit Extra-curricular Activities

250 All higher education institutions have mechanisms to monitor extra-curricular activities. At Universiti Sains Malaysia for instance, these activities are monitored by the Division of Academic and International Affairs. This division has three co-curriculum programme coordinators who oversee the extra-curricular activities for the three campuses which are located on Penang Island (main campus), mainland Penang (engineering campus) and in Kelantan (health campus), on the east coast of Peninsular Malaysia. Coordinators were appointed to monitor the following extra-curricular programmes:

- St. John Ambulance Team (Pasukan Ambulans St. John)
- Police Undergraduate Voluntary Corp (Pasukan Sukarelawan Polis Siswa/Siswi (SUKSIS))
- Reserve Officer Training Unit (Pasukan Latihan Pegawai Simpanan (PALAPES) Tentera Darat, Laut dan Udara)
- University Rover Training Group (Kumpulan Latihan Kelanasiswa)
- Red Cross Team (Pasukan Bulan Sabit Merah)
- Community Service Program (Rancangan Khimat Masyarakat)
- Sports Program (Rancangan Sukan)
- Cultural Program (Rancangan Kebudayaan)

251 Extra-curriculum activities at all public higher education institutions are accredited and given a maximum of three credit units. At private higher education institutions, however, no specific credit is given to these activities. Nevertheless, extra-curriculum activities are accredited for progress and performance evaluation of scholarship holders at the institution.

4.1.4 Postgraduate Activities in Meeting Regional Needs

252 At a public research university such as Universiti Sains Malaysia, the postgraduate research activities are geared towards meeting the regional and national needs. Given that the institution has been identified as a research intensive university, its linkage with the industry plays a critical role in promoting research and development (R&D) in the region. Universiti Sains Malaysia places emphasis on establishing collaboration with the industry to commercialise research, promote nanotechnology information transfer, enhance biotechnology research, provide new products for the construction industry and provide clinical mass spectrometry services in the region. However, it should be noted that private companies should also carry out R&D. Networking between Universiti Sains Malaysia and the industry aims to promote technology transfer to the region, and thus embed highly skilled graduates in the regional economy.

253 There is, however, lack of postgraduate research activities at other higher education institutions in the region due to certain limitations. At UiTM, the Penang branch campus for instance, the education programme is specifically for the diploma level (since 2008). The branch campus's courses only function as feeder to the main campus's degree programmes. Hence, postgraduate activity is at its minimum. This is the similar scenario for the private higher education institutions that operate as feeder to partner international universities offering twinning degree programmes. For this reason, postgraduate activities at these private institutions are few.

4.1.5 Coalition of Regional Experts

254 Coalition of regional experts is only evident at the public research intensive university, Universiti Sains Malaysia. In 2005, the institution was appointed as one of the seven Regional Centres (REC) by the United Nations University-Institute of Advanced Studies (UNU-IAS). The centre serves as a sustainable platform for the coalition of regional expertise and knowledge. It is a network of

existing formal and informal education organisations, mobilized to deliver education for sustainable development (ESD) to local and regional communities. Other than the above, there is also the Regional Centre for Education in Science and Mathematics (RECSAM). This is the centre providing services to the Southeast Asian Ministers of Education Organisation (SEAMEO) member countries in enhancing and upgrading the science and mathematics education. It serves the Penang region by providing expertise to the community, teachers, students and 14 partner schools. Other than that, there is not much regional collaboration in other higher education institutions in Penang.

4.2 Student Recruitment and Regional Development

4.2.1 Regional Recruitment Policies

255 Higher education institutions in Penang do not have specific policies on student recruitment and employment in the region.

4.2.2 Attraction to Students Outside the Region and Mechanisms to Help Students Adapt in the Region

256 Each higher education institution has its own strengths to attract students outside the region. Universiti Sains Malaysia as the only research intensive higher education institution in the region has the top reputation for providing excellent education programmes, particularly at the postgraduate level, and it has fast gained international recognition over the last decade. Hence, the institution is not only able to attract students from the other states of Malaysia but also from other various countries. In 2008, the number of undergraduate students stood at 21, 976 and 194 (0.88%) of them were international students. The graduate student population, on the other hand, was about 6,837 and about 1,520 (22.23%) of them were foreign students (QS Top Universities, 2008). For UiTM Penang, there are no foreign students at the undergraduate level. From the total population of 4,912 students, only 433 (8.82%) are from Penang, which means that a high percentage of the student body (more than 90%) is from outside the region. This could be due to the nature of the programmes offered at UiTM Penang. All UiTM students are sent to the Penang branch campus specifically to pursue their diploma courses and then later continue with their degree programmes at the main campus in Shah Alam, Selangor. For private higher education institutions such as INTI International College, the foreign students at the undergraduate level amount to about 15% and 25% of the local students are from other states in Malaysia. The institution has recruitment agents to help them attract local and international students.

257 To help newcomers adapt to the campus life upon admission, all higher education institutions in the region provide students with adequate academic and non-academic information through programme and student handbooks, and international guidebooks on top of the orientation programmes held. There are also various mechanisms within the higher education institutions (e.g., the International Student Relations Unit, Institute of Postgraduate Studies and various student associations) that help students from outside Penang to adjust to the new environment in the campus. Higher education institutions also have liaisons with international agencies (e.g., the IDP Education, Study Link, Malaysian-American Commission on Educational Exchange, British Council, Asia-Europe Meeting (ASEM) Education Hub (AEH) and European University Association) and local organisations to ensure the welfare of students.

4.2.3 Higher Education Institutions as Part of the Regional Education Supply Chain

258 Higher education institutions in Penang are playing important roles in terms of the regional education supply chain. Universiti Sains Malaysia for instance, is the only research intensive university in Penang. Thus, it is able to offer programmes at the undergraduate and postgraduate level while programmes provided by other higher education institutions serve as feeder to degree programmes

offered by institutions in other regions. In short, higher education institutions are part of the education supply chain within and beyond the region.

4.2.4 Pathways between Regional Higher Education Institutions and Regional Firms

259 At Universiti Sains Malaysia, BJIM serves as the pathway between regional higher education institutions and regional firms. It provides the industry and community with a comprehensive database of the expertise, facilities and resources available at the institution. In addition, the Corporate and Sustainable Development Division (CSDD), as a department of the Office of the Vice Chancellor, explores opportunities for the institution to engage efficiently in business and research with regional, national and international organisations. As compared to Universiti Sains Malaysia, the pathways between other higher education institutions and the regional firms are not so established.

4.2.5 Gathering Labor Market Information and Monitoring the Graduate Flow into the Labor Market

260 Among the various higher education institutions in the region, Universiti Sains Malaysia has more systematic mechanisms to gather labour market information and monitor the graduate flow into the market. For instance, labour market information is gathered by BJIM through forums and dialogues with the industry. The Alumni Liaison Office (ALO), which falls under the purview of the chancellor, could help in monitoring the graduate flow into the labour market on top of the Tracer Study carried out by the counselling unit.

4.2.6 Support for the Graduate Enterprise and Recruitment of Alumni to Ensure Their Return to the Region

261 Higher education institutions in the region support the graduate enterprise by providing them with the necessary knowledge, skills and experience during their course of study at the institution through academic courses and specific entrepreneurship programmes. In terms of recruitment, there are no specific mechanisms in place at higher education institutions to employ alumni so that they will return to the region. Nevertheless, institutions do provide information on job vacancies for the private and government sector through alumni websites such as the E-Job Portal and through databases accessible to students to help them find jobs.

4.3 Promoting Lifelong Learning, and Continuing Professional Development and Training

4.3.1 Continuing Education and Professional Development Activity

262 The Penang Skills Development Centre (PSDC) is centred on career advancement and skills enhancement. Career advancement refers to obtaining the likes of a certificate, diploma, degree, postgraduate degree, masters or doctorate in areas such as engineering, micro-electronics and telecommunications. Skills enhancement, on the other hand, refers to corporate training, SME development and customised programmes. The number of courses held at PSDC to aid in such development has steadily increased over the years (Table 4.2). Kolej Damansara Utama (KDU) also pursues professional development with engineers. Through the Intel industry, PSDC has partner universities such as the Multimedia University, Malaysia; the University of Leeds, University of Wolverhampton and University of Kent, United Kingdom; the Dublin Institute of Technology, Ireland; the Deakin University, Australia; and so on.

Table 4.2 Number of courses and trainees at PSDC

Year	No. of Courses	No. of Trainees
1989	32	559
1990	76	1121
1991	156	2137
1992	231	3799

Source: Kang (1995)

263 There are no specific mechanisms in place to increase access for learners in the region who have been traditionally under-represented in higher education. As a result, for example, the KDU engineering programme has more males than females. Universiti Sains Malaysia, on the other hand, has been active in this area (e.g., the Warga Emas Program) to attract those who have retired to continue their studies. The university has also been providing facilities for the handicapped students in the campus. The retired or elderly citizens should be encouraged to join the education sector because their vast experience and expertise in the industry can contribute effectively to education elements such as the design of university curricula.

4.4 Changing Forms of Educational Provision

264 Wawasan Open University (WOU) is an open and distance learning institution headquartered in Penang with regional and learning offices in Penang, Ipoh, Johor Bahru, Kuala Lumpur, Kota Bharu and Kuching. Selangor, on the other hand, has a WOU regional and support office in Petaling Jaya. Given that WOU is into its 5th semester of operation of offering courses and programmes, it is deemed to be growing steadily and well supported by quality learning materials and student support systems via the Learning Management System (LMS) known as WawasanLearn.

265 Organisational leadership and coordination are at their best to help maintain institutional coherence. There are check and balances in place for quality assurance and standard operating procedures (SOP) for the administrative flow. In the case of WOU, which is an open/online distance learning (ODL) institution, symbiotic synergy is the driving force for the maintenance of institutional coherence given its multi-territorial operations for quality education in the distance mode.

266 At WOU, course delivery is currently print-based and supported by the LMS in place. Major efforts are underway to convert to going fully online in the near future. In the July semester of 2009, a few courses were piloted, using interactive compact disc for course content and textbooks, and further supported by WawasanLearn. The mission, vision, and values embedded in the WOU statements clearly indicate the desire to extend educational opportunities to a wider group and particularly so, to working adults.

267 Conventional and ODL forms of educational provision have their differences and need not be deemed as competitors as they are both fundamentally different in the mode of delivery. Casting differences aside and focusing on curriculum design and pedagogy, both forms can complement each other. Though society may lean towards the more familiar approach (conventional mode), the changes needed in the learning culture and mindset of the community towards the acceptance of ODL, can be realised as independent, self-directed and lifelong learning is more and more emphasised. Even in universities where a dual mode of delivery is practised, each is to its own and serves a defined purpose. The more critical issue is assuring and maintaining quality in both conventional and ODL modes to make the learning experience a more meaningful one.

4.5 Enhancing the Regional Learning System

4.5.1 Coherent Vision of an Education System

268 The Penang Educational Consultative Council (PECC) under the state government provides a mechanism for a coherent vision of an education system at the regional level. However, this is only for the private higher education institutions in the state including PSDC which was initiated by the Penang state government. As a result, only the private higher education institutions in Penang acknowledge the need to develop education on a regional basis. For example, INTI International College Penang has an industry advisory panel (IAP) to advise the college on the needs of the local industry which are mainly in electronics manufacturing. The members of the panel consist of people from the industry, Universiti Sains Malaysia and the college. This panel meets twice a year to discuss the issues and needs of the industry so that the college can update and enhance their curriculum. Recently, Universiti Sains Malaysia has also established IAPs to review the curriculum in specific disciplines.

269 Due to the requirement of the Board of Engineers for accreditation purposes, all schools of engineering in Universiti Sains Malaysia go through a continuous quality improvement process to ensure all the programmes conducted are recognised by the board. Inputs are gathered from the industry, state government and parents to ensure that graduates from the schools are being recognised by the Board of Engineers.

4.5.2 Demand and Supply of Higher Education Institution “Products”

270 Data analysis to establish the demand and supply of different types of higher education “products” within the region was done in 2002 by the PECC for the private higher education institutions. This was more than six years ago. Certainly, there is a need to carry out another study similar to this especially with the current global financial crisis that has impacted the industry in the state of Penang. However, due to the lack of financial support, PECC could not carry out another similar study.

4.5.3 Support for Regional Collaboration

271 PECC being under the Penang state government is coordinating the regional collaboration between higher education institutions. This however, is mainly for the private higher education institutions to attract students to Penang. Higher education institutions have collaborated on a few programmes. For example, KDU Penang and the Island College of Technology are collaborating with Universiti Sains Malaysia to offer a Bachelors Degree in Management and Pharmacy (Division of Corporate and Sustainable Development, Universiti Sains Malaysia, 2008).

4.5.4 Support for Technical Education

272 It must be emphasised that not only degree holders can succeed at the workplace and earn high income. Workers need the technical know-how which can be obtained from technical and vocational schools. Therefore, there is a need to change the mindset of the society and community in regards to this issue. Institutes in Malaysia that conduct vocational training are the polytechnics and community colleges. One such institute which is well known for its vocational training is the Japan Malaysia Technical Institute (JMTI) in Penang.

4.5.4 Multiple Pathways and Transfer Systems

273 There are no multiple pathways with well-coordinated transfer routes and accreditation, including transfer systems, to ensure flexible student transfer between different educational institutions

or between higher education institutions. However, Universiti Sains Malaysia has an SOP for the transfer of credit for students from public higher education institutions to continue their studies in Universiti Sains Malaysia (Division of Academic and International Affairs, Universiti Sains Malaysia, 2008). However, this is only for students from other public higher education institutions such as Polytechnic and UiTM.

4.5.5 Other Links between Higher Education Institutions

274 Other links that exist between universities and other higher education institutions are mainly in the form of collaborative advisory roles. Universiti Sains Malaysia, for example, has a representative in the management council of PSDC who plays the role of advisor to the council. Other linkages are on individual basis. For example, a lecturer from one education institution may be invited to attend an in-house training for the staff of another education institution. For instance, Polytechnic Balik Pulau invited a lecturer from Universiti Sains Malaysia to be a guest lecturer to provide training for the lecturers in conducting educational research.

4.6 Conclusion

4.6.1 Collaboration between Higher Education Institutions and Stakeholders

275 Regional collaboration between the universities in the region, related to teaching and learning, takes place on a voluntary basis and is mostly ad hoc in nature. In other words, there are no proper mechanisms in place to enhance collaboration between the universities. The role of PECC is very much restricted to private higher education institutions in the state of Penang and is mainly to attract students to enroll in private higher education institutions.

276 There are limited collaborations between universities and other higher education institutions in the state of Penang. The Island College of Technology and KDU Penang have collaborated with Universiti Sains Malaysia in offering a Bachelors Degree in Pharmacy and Management. INTI International College Penang has an IAP to assist them in planning and reviewing the curriculum based on the needs of the local industry. Three lecturers from Universiti Sains Malaysia are members of the panel.

277 There are limited collaborations between higher education institutions and other stakeholders in the state of Penang. In the School of Electrical and Electronic Engineering in Universiti Sains Malaysia, a committee, involving people from the Penang industry as well as a representative from the state government, was set up to ensure graduates from the school are recognised by the Board of Engineers. In 2007, Intel chose Universiti Sains Malaysia to be the recipient of RM30, 000 in the form of research grants to enable the university to embark on research activities and purchase equipment needed for research. Agilent Technologies also chose Universiti Sains Malaysia in 2007 to be the site to establish the Technology Instrument Laboratory, the first in the country. The management council of PSDC has a representative from Universiti Sains Malaysia. The main functions of the council are to provide PSDC advice on its general direction as well as deliberate on policy matters. The IAP of INTI International College Penang has three members from the local industry. The role of the panel is to ensure that all engineering programmes and courses conducted at the college meet the academic standards and requirements of the industry.

4.6.2 Strengths, Weaknesses, Opportunities and Threats

278 Penang has been one of the main focal points of manufacturing activities in Malaysia. The manufacturing of electrical and electronic (E&E) goods is the most important component of the Penang economy. The southern part of the island is highly industrialised with multi-national corporations

(MNC) and electronic plants such as Dell, Intel, Motorola, Agilent and Advanced Micro Devices (AMD) (all located within the Bayan Lepas Free Industrial Zones (FIZ)). Penang (the first state outside of Cyberjaya) was accorded the Multimedia Super Corridor (MSC) Malaysia Cybercity status in January 2005 with the aim of becoming a high technology industrial park that conducts cutting edge research. These are the main strengths of Penang in attracting more students to its higher education institutions besides merely being a popular tourist destination and George Town being declared a United Nations Educational Scientific and Cultural Organisation (UNESCO) World Cultural Heritage City in July 2008.

279 In recent years, however, the state is experiencing a gradual decline in the foreign direct investment due to economic factors such as cheaper labour costs in China and India. Moreover, the recent economic downturn has also reduced the amount of the foreign direct investment in the state. Thus, to stay competitive in attracting foreign direct investments, there is a need to focus on education, training and skills. In other words, there is a need to create new areas of expertise and this means more investment in education and skills. To do that, PECC should play a proactive role in encouraging collaboration between higher education institutions (both public and private) and other stakeholders, including industries not only in manufacturing but others as well, such as tourism, agriculture and so on. By doing so, higher education institutions will be able to plan and focus more on the needs and requirements of the local industry in terms of human capital development. In other words, this will encourage cooperation among higher education institutions and perhaps make Penang the centre of excellence for higher education in the country.

280 Seeing that Universiti Sains Malaysia is the first APEX university in the country, the Penang state government (in this case, PECC) should involve the university in many activities to further propel the higher education sector to greater heights. Universiti Sains Malaysia has many efficient research centres including the National Higher Education Research Institute (IPPTN) which has expertise to provide policy recommendations to improve the higher education sector of the state. This is to ensure that higher education institutions in Penang are able to meet the needs and provide the skills required in the labour market, not only for now but also in the future.

4.7 Emerging Issues

281 The relationship between education and work is crucial, and in this modern society, new practices of industrial production have made industries more dependent on new information technology and expertise. Malaysia's vision of achieving a developed country by the year 2020 in the global economy has made information and communication technology (ICT) a big agenda in transforming the country from a production to a knowledge-based economy. Thus, more efforts are needed to use e-learning in training and educating the workforce. More collaborations between higher education institutions and the industries are required to bring this e-learning concept forward. Special emphasis has to be placed on developing new forms and methods of teaching, practical training and cooperation with the industries. More importantly, higher education institutions and the industries need to "think global and act local" in order to enhance internationalisation while also taking into account, regional needs and differences.

CHAPTER V: CONTRIBUTION TO SOCIAL, CULTURAL AND ENVIRONMENTAL DEVELOPMENT⁵

Introduction

282 According to Morshidi (2002), in his analysis of the interface between the university and region, the internationalisation of universities in some western countries evolved directly from an orientation and commitment to the larger communities of which they are a part of. According to Goddard & Chatterton (1997) (cited in Morshidi, 2002), the university should stress on their contribution to regional development as their main service function, in particular, community service because it is of great relevance to the nation for this element is most strongly embedded in most regions. In addition, universities can play a significant role in 'providing civic and regional leadership' in line with the 'rise of the local entrepreneurial state and community empowerment' movement. Hence, it is important to assess the local higher education institutions' contributions to the development of Penang. This chapter briefly describes the social, cultural and environmental challenges faced by the Penang region. It then goes on to illustrate how higher education institutions that exist in the Penang region contribute to the social, cultural and environmental sustainability, and thus become a significant element of the region's fabric.

5.1 Social, Cultural and Environmental Challenges of Penang

283 Penang is a major regional city since the colonial era and arguably, this has contributed to its economic security and also its diverse and well-educated population. The general level of education and literacy rate in Penang is considered among the highest in Malaysia. Noteworthy is the historical instances of the establishment of education institutions in the region: Penang Free School, the first English school in Malaysia, established in 1816; the oldest Malay school, Sekolah Kebangsaan Sungai Gelugor, established in 1826; the oldest Chinese school in Malaysia, Chung Hwa Confucian School, founded in 1904; and the second university in Malaysia, Universiti Sains Malaysia, established in 1969, are all located in Penang. Another important fact that has significantly impacted the local community of the region is that Penang was also the home of the peninsula's first newspaper, the Prince of Wales Island Government Gazette which came into being in early 1806. By serving as a public medium for the exchange of information and ideas, the newspaper brought in new knowledge and ways of thinking to Penang's elite. In addition, to date, more than 20 higher education institutions have been established, and are now operating in Penang (Zainal et al. 2008). At present, the local community continues to be highly educated and engaged in local issues.

284 As mentioned in Chapter I, the Penang Free Trade Zone (FTZ) was established in the 1970s and was followed by other developments and the urbanization of Penang. Due the smallness of Penang, developments are encroaching the green areas (also known as the Green Lung of Penang) of Balik Pulau. Hill slopes, coastal areas and idle agricultural lands are being converted to residential and commercial development areas. In addition, negative impacts of solid waste, and water and air pollutions from urban and industrial activities have increased (evidenced by the increasing number of polluted rivers and coastal areas in Penang). Arguably, urbanization has contributed significant socio-economic and environmental challenges to Penang.

285 Thus, it is important to initiate and develop a genuinely respectful partnership of the academe and community to handle the above-mentioned issues, and in the process, co-create knowledge to generate engaged scholarship. As this section sets the scene for the rest of the chapter, the following

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sections present an analysis of the contributions of higher education institutions to the social, cultural and environmental development of the Penang region.

5.2 Social Development

286 Institutions of higher education traditionally contribute to social development through their three-core mission of teaching, research and service, especially when the vision embraces giving, nurturing and valuing citizenship and community. This includes the provision of access to infrastructure; provision of social, medical and educational services; engagement of faculty; application of research to issues in the region; and involvement of students.

287 Despite the limited number of universities in the region, their social and community engagements towards social development through their diverse academic programmes, research expertise and provision of diverse services via the activities of their mission, are rather extensive and varied even though the intensity and extent of their involvement could be potentially deepened. The key players here are the well-established 40-year-old public university, Universiti Sains Malaysia and Wawasan Open University (WOU), a very young two-year-old open private university which esteems itself as the 'People's University'. Thus, the scope of their activities, capacities and actual contributions vary distinctly. Both universities consider themselves higher education institutions with explicit moral and social responsibilities.

288 It is in the area of infrastructure facilities that the region's institutions of higher education have generously avail themselves to the general public and civil society organisations even though in practice, the procedures of application and approval for their use are generally challenging and demand some perseverance on the part of users. Universiti Sains Malaysia prides itself as a 'University in a Garden' as a metaphorical concept in promoting healthy living, social well being and sustainable development. The campus compounds are popularly sought as a venue for diverse public functions and activities. Universiti Sains Malaysia provides its staff and students with sports and recreational facilities such as a swimming pool, football field and tennis courts, to name a few, and indoor facilities that include a mosque, lecture halls, banks and cafeterias. Some of these, such as the mosque and banks are freely accessible to the public, but for the use of other spaces, such as the library, fields and lecture halls, application procedures and rates of payment apply. The heritage building which houses the WOU has enhanced it to play a special role in sponsoring and hosting a variety of events, especially artistic and cultural activities which have a heritage and social development dimension. These programmes range from co-sponsorship to the provision of venue space to local arts/cultural performances, to the support of a residential artist programme.

289 One of Universiti Sains Malaysia's particular strengths lies in the area of health and medical services. Under its recently established Advanced Medical and Dental Institute (AMDI), the university has been able to provide health services for the local community. The services include the running of clinics for outpatient treatment and health screening. There are 12 clusters in AMDI:

- Ontological science,
- Cardiovascular science,
- Integrative medicine,
- Infectious diseases,
- Brain science behavioural science,
- Oral science,
- Immunological science,
- Translational research network centre,
- Transfusion medicine,
- Radiological science,
- Clinical toxicology and poisoning, and
- Healthy lifestyle

290 AMDI has eight enabler services: the clinical centre (medical, dental, pharmacy, laboratory), animal research centre, bio-information and communication technology (ICT) centre, central management and financial administration, transnational knowledge and information centre, facilities management, business intelligence centre and research secretariat (Advanced Medical Dental Institute).

291 It is envisaged that in the near future, the institute will serve as a specialist centre for the study of oncology and women's health. While this may reduce the university's engagement with the community as only referred patients will be accepted, there are plans to establish partnerships between the centre's specialised researchers and local community in identifying health problems and providing solutions to a healthier lifestyle. As such, community education programmes such as public lectures, health exhibitions, awareness campaigns and seminars will continue to be organised to create awareness on the prevention of cancer and healthy living. Through its medical infrastructure and knowledge base, this centre has become an important and established part of the regional health care system. In fact, the centre has already successfully reduced the diagnostic period of breast cancer. It is hoped that the centre will have impact on long-term healthy living through its systematic and joint clinical-educational programmes with schools located in its immediate milieu.

292 The AIDS Action and Research Group (AARG), established since 1994, is based at the School of Social Sciences at Universiti Sains Malaysia. Members of AARG consist of academic and non-academic staff. They are dedicated to preventing the spread of HIV/AIDS and helping people who have been infected and affected by the pandemic.

293 The group has expertise in various fields of knowledge including sociology, psychology, public health, accounting, economics, drug research and rehabilitation, languages, nursing and many more. By engaging in various community projects, research, education and training, AARG contributes to the nation's efforts in dealing with the psycho-social issues that are related to HIV/AIDS. The group also provides educational training on HIV/AIDS and acts as a social activist in fighting the discrimination towards people suffering from HIV/AIDS.

294 AARG has been active in organizing many programmes such as workshops, seminars, forums, exhibitions and dialogues about HIV/AIDS. Community service is provided through its drop-in centre and harm reduction programmes, especially the needle exchange programme for the community of drug users. AARG also engages in capacity building related to HIV/AIDS counselling (Ismail Baba, 2010).

295 Universiti Sains Malaysia's Islamic Centre offers a wide range of activities ranging from the operation of a nursery and kindergarten to women's affairs and public religious lectures/workshops are carried out. Free daily meals are provided by the centre mainly for university staff and students during the annual fasting month as part of its charity service. Despite the many noble activities that the university engages in through the centre, none demonstrates long-term partnership with the respective communities. In addition, religious centres supporting non-Muslim communities are absent. Likewise, inter-faith and inter-ethnic activities have not yet taken root.

5.2.1 Partnerships and Community Engagement

296 With a track record of 40 years and the flourishing of various research centres and clusters, Universiti Sains Malaysia has been playing an important role as a provider of research and subject/discipline expertise in gender, community and social development issues. These specialised research capacities and expert advice are often sought by government agencies as well as non-government associations, which often lead to policy formulation and the implementation of concrete programmes to address the respective problems researched on. In some situations, university representatives have been invited to provide direct expert advice or serve on the executive or advisory boards of non-government organisations (NGOs) or in state and national committees.

297 Most of the involvement with the community is in the form of collaborations in the delivery of mainstream social and medical services. This is in accordance with the goals and agendas of the university, especially in seeking the support of community groups to collect data or implement the agenda of Universiti Sains Malaysia and its respective research clusters. However, the provision of expertise is neither on the basis of equal partnership with the external community nor on a long-term sustainable track. Collaborations between higher education institutions in Penang and various groups/organisations in the community are very common. However, despite the many and diverse noble activities that the institutions are involved in, most of the activities do not represent sustained long-term equal partnerships with those communities or groups.

298 However, with its Accelerated Program for Excellence (APEX) status and the establishment of an institutional level division on industry and community, Universiti Sains Malaysia, is well placed to develop and deepen its current various forms of partnership to engage more extensively with the community as an exemplary model of a more sustained people-centred establishment.

299 Students are becoming more socially engaged through coursework requirements and extra-curricular activities. Through these activities, students have been encouraged to be more involved with the concerns of the community. The Universities and University Colleges (Amendment) Act 1996 is currently being reviewed to give more social and political space to students and faculty to become more active, socially responsible and engaged citizens.

5.2.2 Policy, Brokerage and Other Advisory Roles

300 Universiti Sains Malaysia has been actively engaged in campaigning against drug use/abuse, for smoke-free zones and the promotion of peace.. Its brokerage roles are grounded in the everyday demands of effective service delivery. Universiti Sains Malaysia has, in the past, been commissioned by government agencies to provide expert training for local community leaders in the art of mediation and reconciliation. Most of these activities carried out have been transnational in nature. Under various projects such as the Consolidation for Peace Program and Dream Keepers, Universiti Sains Malaysia serves as the centre in providing expertise on peace building and conflict resolution for the conflict-afflicted areas in other regional countries, primarily, in Mindanao (the Philippines), southern Thailand and until recently, Aceh (Indonesia). Focusing on these three areas, numerous ad hoc seminars, workshops and trainings have been offered to sow understanding between the different factions. And, while such activities have indeed opened up space for the university to play a mediating role, actual outcomes have remained rather indistinct.

301 The university's experience in policy research dates back to the 1970s when regional and national government agencies provided funding for policy research. This led to the establishment of the Centre for Policy Research which thrived till the new millennium when it was restructured to include the focus on international studies. In recent years, its role has been somewhat reduced to being a facility provider for ad hoc lecture series by distinguished individuals as no new projects have been recorded since 2007. In its pioneering years of the 1970s and 1980s, Universiti Sains Malaysia's contribution ranged from applying research outcomes to giving policy suggestions/recommendations, leading to policy implementations. Various projects such as the development of a national integrated data system and the impact of low-cost housing development on the socio-economic structure and ethnic integration were carried out to ensure the smooth social development of Penang. Of particular significance was the research on poverty, leading to the implementation of government initiatives to address rural poverty. These initiatives were later absorbed into a government programme. Another initiative of the 1980s was the participatory action research by the faculty of the School of Social Sciences in collaboration with the local and national NGOs to address the social problems of the migrant women workers in the newly established FTZs. Apart from these initiatives, most of the programmes were along the lines of expertise

delivery and provision. They were not on the basis of a sustainable long-term equal partnership with the external community.

302 A recent social development endeavour that Universiti Sains Malaysia is spearheading with the state government is in the efforts of the National Poison Centre in making Penang a smoke-free zone. This will provide great potential for long-term engagement with the community to affect long-term behaviour and lifestyle changes through advocacy research and community education.

5.3 Cultural development

303 Situated in a culturally diversified city that is equally rich in its heritage and history, the key higher education institutions in the region, namely, Universiti Sains Malaysia and WOU, certainly contribute to the region's cultural development and advancement. Cultural activities in the city take the form of performances (such as theatres, concerts and dances), exhibitions (such as art and book exhibitions), festivals (traditional cultural festivals as well as film festivals from foreign countries) and education programmes (mainly geared towards creating awareness among the public on cultural issues). Penang also has a variety of sporting activities including both outdoor and indoor sports. The facilities for these sporting activities such as clubs, stadiums and swimming pools, can be found in the city.

304 The support rendered by higher education institutions can be roughly divided into two categories, namely, institutional and individual support. Institutional support includes organising and collaborating with others in organising activities and events. This includes providing facilities such as stadiums, museums, halls and galleries as well as extending financial and expert support. On the other hand, support at the individual level refers to the activities and programmes carried out by the staff of these higher education institutions that contribute to the development of sports, arts and culture of the region.

305 It is interesting to note that while the emphasis of Universiti Sains Malaysia is on the sciences, its School of Arts continues to thrive and maintain its relevance in the immediate community and the nation in general. The school offers undergraduate and postgraduate programmes in areas such as the fine arts, drama and theatre and music. The school renders support to cultural development at both institutional and individual levels. At the institutional level, the school actively pursues the development of cultural activities not only to further expose its students to the regional culture but also to showcase products by its faculty and students to the larger community.

306 The School of Arts has the facilities to enable performances and exhibitions to take place. Dewan Budaya, with a seating capacity of 493 persons and a 40 x 50 square feet stage, is open to the public for renting. While it provides space for the university's activities such as forums and productions, the public has also rented it for their own events such as school and musical concerts. The school also has two galleries and an exhibition hall that provide space for its students and staff, and artists from outside the school to showcase their work. Activities conducted throughout year 2008 include music festivals focusing on different music genres that include traditional (or ethnic-based) as well as modern traditional Malay dances and theatres. It can be said then that while top priority is given to educating the students, the School of Arts has a strong sense of social responsibility in fostering cultural development in the region.

307 The Arts Education Programs for Young People (ARTS-ED) initiative was established under the Penang Educational Consultative Council (PECC) in March 1999 in collaboration with Universiti Sains Malaysia's School of Arts with the cooperation of the Penang State Education Department. This programme empowers young people to explore and discover their cultural and historical identities in a diverse, living and changing heritage. The project aims to promote the artistic ability and creativity of students through art and create awareness on the opportunities in the field of arts. The initiative involves

young residents in urban and rural communities in mapping out and documenting their history, cultural assets (such as the performing arts and crafts), and built and natural environment. It involves the local community, such as residents; advocates, such as those from the state and non-government sector (as co-participants); and other parties, such as craftsmen, historians, artists, conservationists and teachers.

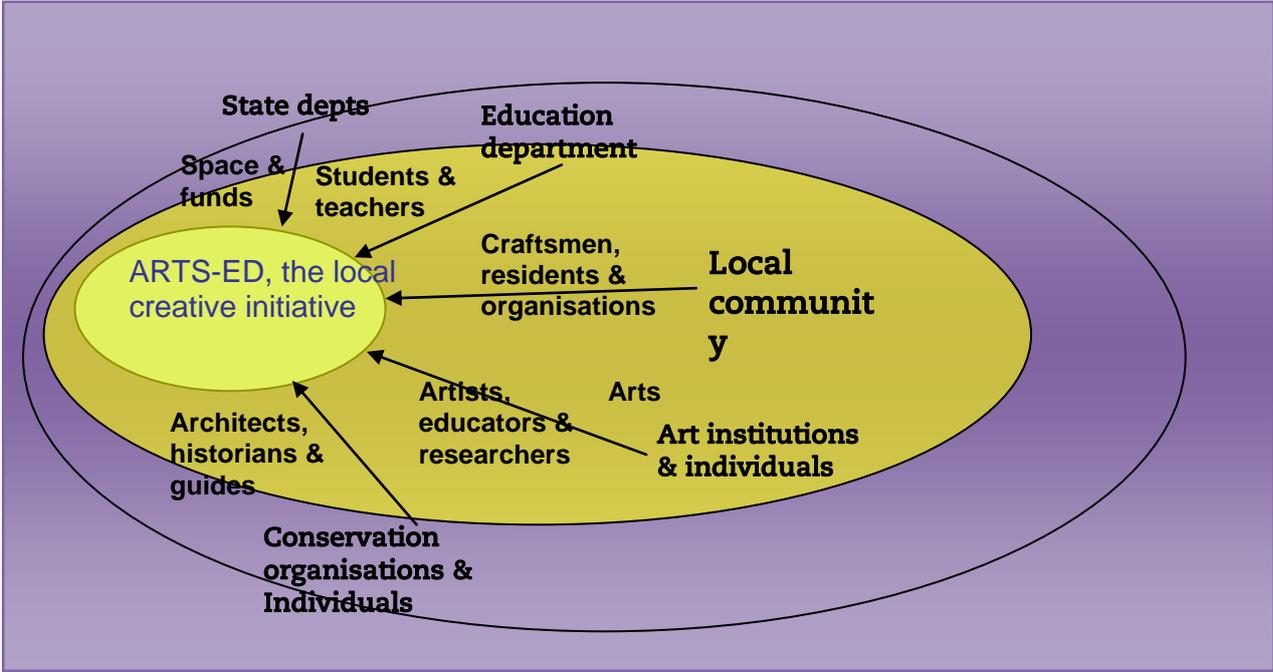


Figure 5.1. Parties involved in the Arts Education Programs for Young People (ARTS-ED) initiative
Source: Authors — Janet Pillai (2009)

308 ARTS-ED presently runs two site-specific initiatives: a programme in urban George Town entitled Anak-Anak Kota (AAK) which began in 2001 and another in rural Penang entitled myBALIKpulauan which began in 2004. The ‘site’ is the focal point of the ARTS-ED projects and is utilised as a platform for creative interaction between arts, culture and life. Within the site, participants attempt to map out cultural assets and narratives, and communicate these to the community and visitors. Participants use the arts to interpret and promote their living culture through interpretative projects, performances, publications and exhibitions.

309 AAK facilitates young residents in retracing the lost narrative of their multi-cultural heritage through the arts and in developing an appreciation for their cultural assets. AAK is designed to offer a variety of out-of-school, informal programmes. The projects are located at a real site and are focused on the study of cultural heritage associated with the local lifestyle. The content of the programmes basically introduces children to historical origins, artistic concepts, philosophy, skills and heritage values contained in rituals, arts, craft, architecture, foods and trades in the local environment using the following approaches:

- participation in hands-on projects in the community,
- research, documentation and promotion of the living heritage,
- communication of information on cultural heritage to the public, and
- creation of new cultural products from innovation on traditional processes

310 In a nutshell, the creative initiatives result in children engaging with their culture and participating in some form of cultural enterprise. Through their research projects combined with creative end products such as performances, artwork, craft, brochures, videos and websites, they promote the community's assets.

311 Several of the AAK projects involve on- or off-site interpretations. These interpretations may be in the form of exhibitions, performances or publications intended to educate the public or as advocacy for the conservation effort. One example is the interpretation using photography, web and videos of three Penang artists' works and their relationship to history, local tradition and the environment. These were displayed in public exhibitions at two galleries. Another example is the brochures produced for tourist. These brochures are walking tours documenting the history, processes and products of 20 endangered trades in the inner city.

312 The AAK model has succeeded to different degrees in raising the level of awareness of young residents and the community regarding cultural issues and in increasing their appreciation for their cultural assets. Innovation was attempted in the design of informal educational programmes taking into account changes that could be made in the system and matters that could bring about change in the attitudinal/mental mode. The changes needed refer to the changes in perception towards local cultural systems and in traditional ways of working by creating new thinking trends among children; helping children identify and document the inter-connectivity of culture to social, philosophical and economic systems; and instilling in the young, social responsibility towards conserving heritage assets.

313 WOU, a private university in the city which started its operations in 2007, is also active in pursuing community-based cultural events. Its support also comes in the form of financial contributions and in organisation, administrative and venue support. The university worked closely with Ombak-Ombak Arts Studio in 2008 to organise the arts performance called "Storm in a Box" and community performance entitled "Emily of Emerald Hill". It has also been the venue for talks and seminars that are open to public, ranging from issues such as democracy and the United States media to the Japanese style management.

314 There are many non-government bodies in the city that diligently work to promote the preservation and conservation of heritage buildings in the region, especially in George Town. These bodies include the Penang Heritage Trust and Badan Warisan Malaysia. Experts from Universiti Sains Malaysia's School of Arts and School of Housing, Building and Planning have worked either directly or indirectly with these bodies in the said area. Works on the restoration of buildings such as Fort Cornwallis and Aceh Street Mosque were conducted by the School of Housing, Building and Planning, and its website is directly linked to the website of Badan Warisan Malaysia. Similarly, members from the School of Arts have worked closely with the Penang Heritage Trust on research projects involving the buildings and life in the inner city of George Town. The scope, research and expertise in the area of heritage conservation and restoration certainly contributed to the collective work in the community in securing the Heritage City status awarded by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). Documenting and increasing awareness on untapped heritage in the Penang region is regarded as top priority. This is in addition to the research on the natural heritage of the northern region currently conducted by Universiti Sains Malaysia.

315 The Tunku Fauziah Museum and Gallery (TFMG) in Universiti Sains Malaysia plays an important role in enhancing the appreciation for art and culture among the population of this region through various programmes. Its support is largely at the institutional level. An example is its exhibition called "In the Name of Time" which is jointly organised by the university's cultural centre and School of Arts with support from industries, individuals and organisations outside Universiti Sains Malaysia. Well-known artists and performances in the country have made their appearances at the exhibition. The

activity gives exposure to students on the professional management of arts and cultural activities, while at the same time, allowing the community at large to learn and appreciate the region’s arts and culture.

316 Another programme organised by the museum is called “Creative Link” which is a series of fun and interactive programmes to enrich the visitor’s knowledge on science and technology. It also offers short-term courses on the art of *batik* drawing and printing. “Central Pillar”, another activity conducted by TFMG, focuses on talks, seminars and workshops for students, professionals and cultural activists. TFMG also promotes new media, and local and international independent films through its programme called “Virtual Screen”. From 2006 to 2008, TFMG organised a total of 103 programmes as shown in Figure 5.2 below.

317 TFMG is a member of the International Council of Museums (ICOM), Malaysian Museums Association and Association of Tourist Attraction in Penang (ATAP). Their collection of modern art combined with the above-mentioned programmes have attracted many visitors, both the local community as well as foreign tourists (as is shown in figure 5.3).

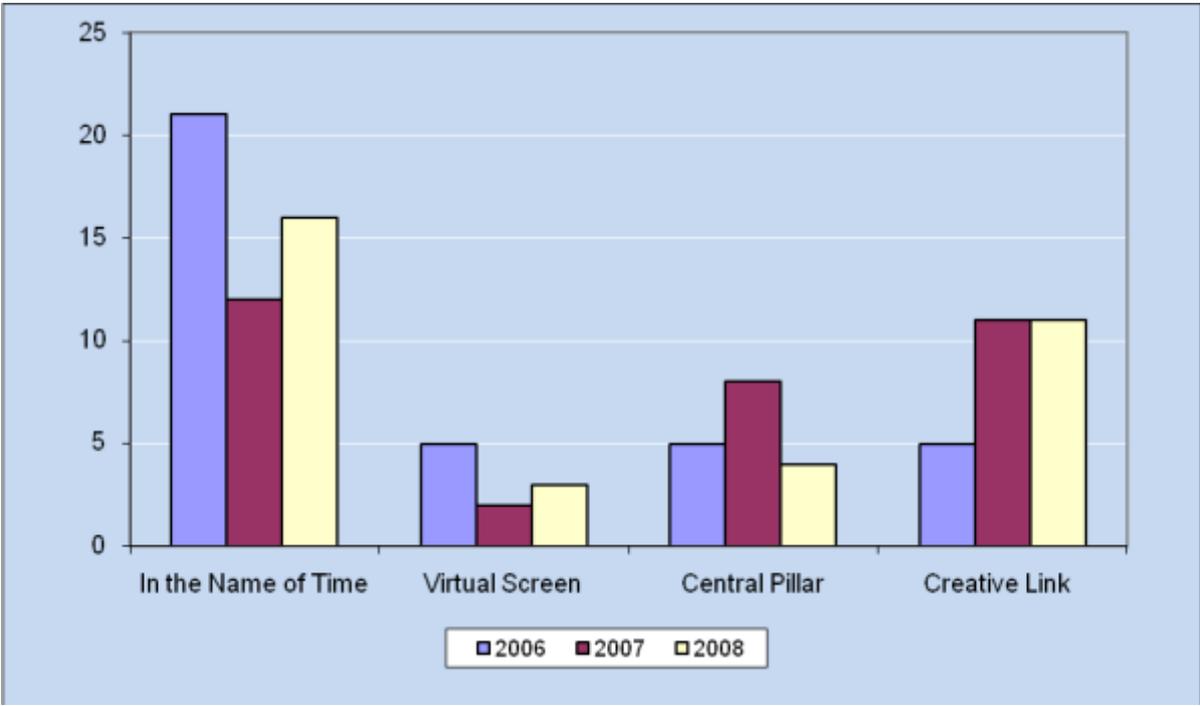


Figure 5.2. Programmes by the Tunku Fauziah Museum and Gallery (TFMG), Universiti Sains Malaysia, 2006–2008

Source: Tunku Fauziah Museum and Gallery, Universiti Sains Malaysia (unpublished)

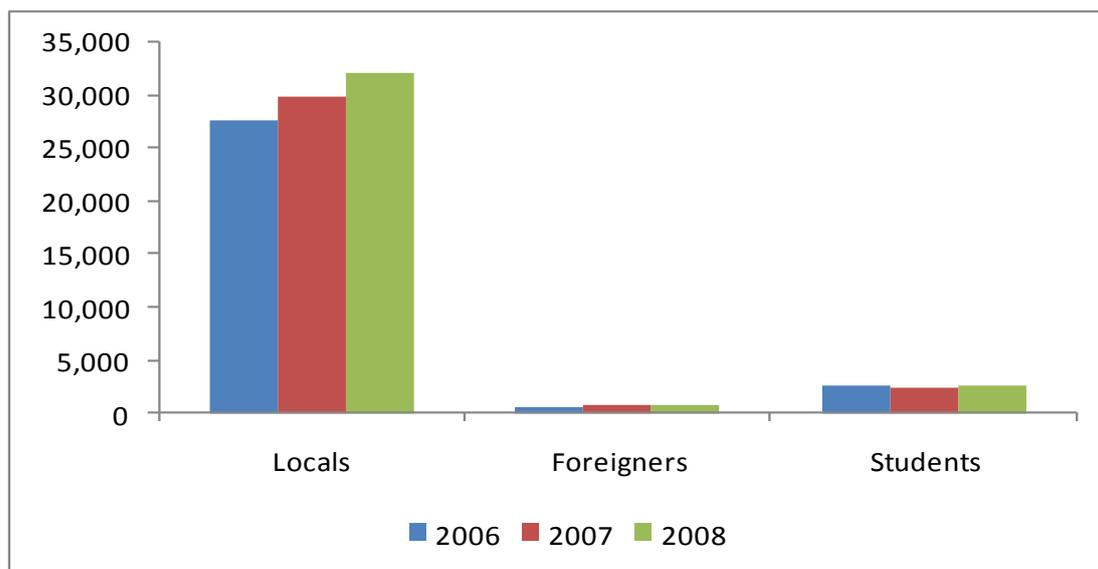


Figure 5.3. Visitors to the Tunku Fauziah Museum and Gallery (TFMG), Universiti Sains Malaysia, 2006–2008

Source: Tunku Fauziah Museum and Gallery, Universiti Sains Malaysia (unpublished)

318 As for sports, Universiti Sains Malaysia has facilities that encourage sporting activities such as a stadium, swimming pool, sports club and spacious fields. Student sports activities are many, some of which involve competitions with other universities and the community. For instance, in year 2008, Universiti Sains Malaysia was involved in basketball matches and the fencing championship in Thailand as well as inter-university soccer and the archery competition in the region. Universiti Sains Malaysia also hosts hockey and netball festivals which draw participation from local schools in Penang and schools from other states across Malaysia. In fact, except for the month of Ramadhan and the year-end period, the university's 2008 sports calendar was filled with activities. Universiti Sains Malaysia also rents out its facilities to the community through its sports unit (this includes the public schools in the community, government offices and private organisations).

5.4 Environmental Sustainability

319 The Penang region is unique in the sense that it is well known as an industrialised region and also for its natural heritage attractions. Penang is a major regional city and has the third largest economy after the states of Selangor and Johor. It is also proud of its rich and diverse natural environment that hosts rainforests, mangroves and extensive marine wildlife. However, Penang's environment is suffering from the negative impact of human activities such as rampant property development at hilly areas, water pollution from industrial effluent and air pollution from high usage of private vehicles. Other environmental sustainability issues are the shortage of clean water supply and degradation of the coastal environment.

320 As mentioned earlier, Penang's population is highly educated and engaged in local issues and development. Inherently, the stakeholders including higher education institutions in the region are directly or indirectly involved in ensuring Penang's development activities are sustainable in all the three pillars of sustainable development: social, economic and environment/ecology.

321 Located at a hilly area on the eastern part of Penang Island, Universiti Sains Malaysia inherited a beautiful campus from the colonial era. At the beginning of the new millennium (Figure 5.4 refers), Universiti Sains Malaysia adopted the concept of the ‘University in a Garden’ which governs the overall process of policy drafting and implementation, and the execution of activities in the university’s campus. The idea is to develop the university based on the following “gardenic” concept: Garden and the People, Garden of Knowledge, Garden of Vistas, Garden of Nature, Garden of Heritage and Garden of Tomorrow. This metaphor was later translated into ‘Program Kampus Sejahtera’ (or loosely translated as the Healthy Campus Program) which hosts most of the sustainable-related projects and activities conducted by Universiti Sains Malaysia since the year 2000. The programme is based on five basic principles: (a) volunteerism, (b) research- and data-driven activities, (c) team-based initiatives, preferably multi-disciplinary in composition, (d) insourcing, referring to the expertise within the university, and (e) documentation of activities — for instance, in the form of monographs (Abdul Razak & Mohamed, 2008).

322 Universiti Sains Malaysia was chosen as the first Malaysian university to hold the APEX status. The transformation plan entitled “Transforming Higher Education for a Sustainable Tomorrow” clearly reflects a strong leadership commitment in achieving sustainability objectives which is a key success factor in the implementation of a management system. At this juncture, it is interesting to observe the tremendous efforts, energy and thoughts of the Universiti Sains Malaysia community in interpreting and charting the roadmap to transform the university into a sustainably led university.

323 One of the most important principles of sustainability is to establish a strong functional and institutional linkage between universities and the communities locally, regionally and internationally. As a research university, Universiti Sains Malaysia has established a strong pool of experts in different disciplines from various research centres and laboratories in environmental studies and research. The expertise and facilities available at Universiti Sains Malaysia are in high demand among the local industries and agencies. USAINS Holding Sdn. Bhd. is the commercial arm of Universiti Sains Malaysia and its main functions are to market and promote Universiti Sains Malaysia’s expertise, and research and development (R&D) products; handle rental of facilities, equipment and services; and provide consultancy, testing and analytical services, and personnel training and development. The environmental testing and analytical services rendered by Universiti Sains Malaysia use equipment and technicians from the laboratories of various schools and centres such as the Environmental Technology Division, School of Industrial Technology, School of Chemical Sciences and School of Physics as well as schools and centres of the engineering campus in Nibong Tebal, Penang.

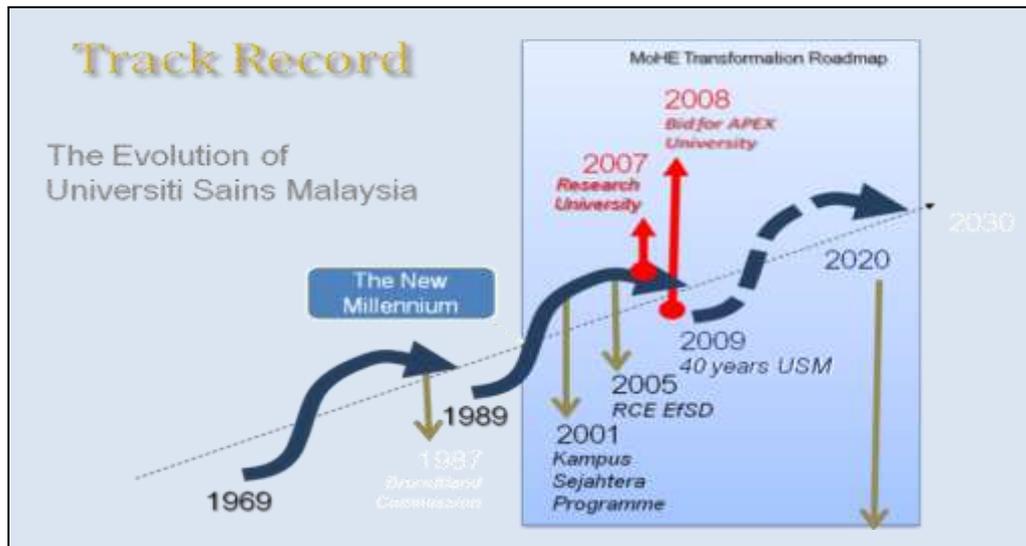


Figure 5.4. The evolution of Universiti Sains Malaysia on sustainability

Source: Abdul Razak & Mohamed (2008)

324 Professional consultation and research activities are usually based on the individual or group expertise available at the schools and research centres. An example of professional consultation is for conducting environmental impact assessment studies for various prescribed activities such as construction of dams and wastewater treatment plants, and developing flood mitigation designs. The River Engineering and Urban Drainage Research Centre (REDAC) of the engineering campus conducted research and consultancy projects on sustainable river management which included appraisals for the design of a flood mitigation project of Sungai Muda and the effects of sand mining of three rivers (Muda, Langat and Kurau).

325 Dissemination of knowledge to the local community via technical training, seminars and conferences is another inherent function of higher education institutions. For instance, REDAC and the Department of Irrigation and Drainage Malaysia jointly organised trainings in compliance with the Urban Stormwater Management Manual (Manual Saliran Mesra Alam (MSMA)) for Malaysia. These trainings had direct impact on improving the designs for new developments and mitigating measures to improve environmental degradation in the region as the participants also comprised of locals. Environmental-related conferences were conducted by various departments and schools in Universiti Sains Malaysia such as the Geography section, School of Humanities, Environmental Technology Division, School of Industrial Technology, School of Housing, Building and Planning and School of Chemical Engineering. Diverse groups attended these conferences including representatives of local government agencies and environmental NGOs, and school teachers, all of whom were encouraged to share and disseminate their knowledge and experience to directly or indirectly benefit the region.

5.4.1 Environmental Sustainability on Campus

326 Most of the higher education institutions in Penang demonstrate environmental sustainability in the least by practicing water and energy efficiency in their campuses. Other popular activities related to the environment are waste minimisation activities such as recycling and tree planting. It is interesting to note that, water and energy efficiency is usually a top-down project as it has direct impact on the management in terms of reduced electricity bills, whereas, projects such as waste recycling are bottom-up initiatives, initiated by either the university staff or students (individuals or groups).

327 The 'Kampus Sejahtera' Program was officially launched by Universiti Sains Malaysia in March 2002. Many projects and activities are conducted by Universiti Sains Malaysia with support from the programme secretariat. As the name implies, the activities conducted are not only limited to environmental sustainability projects but also programmes covering issues related to food, transportation, health, accessibility and even mental health. The programmes are aimed not only to assist Universiti Sains Malaysia in educating and encouraging the campus community to take ownership of the university and engage in activities related to sustainability, but also in sowing and nurturing actions and habits that will extend beyond the campus into the outside community.

328 The White Coffin campaign is an interesting and most successful student-driven project in Universiti Sains Malaysia. A group of students initiated this campaign and then were encouraged with full support from the university's top management and guidance from the Kampus Sejahtera secretariat to take the lead against the use of polystyrene on campus. The White Coffin (referring to white containers made from polystyrene) campaign was launched through the 'Kampus Sejahtera' Program and sustained by the students themselves. Activities conducted during the campaign were the Polystyrene Free Day, meetings with cafeteria operators, MyPledge (for a sustainable world) and students campaigning, enforcing and introducing the use of biodegradable or own food containers to pack food as environmentally friendly alternatives to using polystyrene food containers. Following the success of the White Coffin campaign, Kampus Sejahtera launched another campus-wide campaign to reduce and stop the usage of plastic on campus, known as the "Say No to Plastic" campaign.

329 Among the many private higher education institutions in Penang, Kolej Damansara Utama (KDU) Penang is one of the colleges which is active in promoting environmental issues in its campus and the region. One of the activities organised by the KDU Penang Student Council is the Green Environmental Project conducted from March to December 2009. The activities conducted in this project are the logo design competition (at state level), Green Peace Fair, visits to recycling plants, and environmental talks and workshops. Other environmental-related initiatives of KDU are water and energy efficiency, waste minimisation and recycling. The waste minimisation and recycling activities were initiated by one of the lecturers, and with encouragement from the top management, the activities were promoted campus-wide. Interestingly, the KDU activities highlighted above were bottom-up initiatives that received positive response and support from the college's top management.

5.4.2 Sustainable Initiatives and Local Engagement

330 Penang is known for its environmental sustainability projects and as mentioned earlier, Penang's environmental activism can be attributed to its educated and engaged population, a legacy of its colonial status. These environmental groups developed as local citizens became increasingly aware of international environmental concerns and the problems existing in their own areas. Many individuals, including academics working at higher education institutions in Penang, are involved as active members of the local environmental NGOs. Therefore, it can be said that these local NGOs have direct and indirect relationships with higher education institutions on collaborative and consultative projects, and the advocacy of environmental sustainability activities.

5.4.3 Sustainable Penang Initiative (SPI)

331 In October 1997, the Sustainable Penang Initiative (SPI) was launched with the aim to make the state of Penang a better place socially, ecologically, economically and culturally through a process of popular participation involving the civil society, government and businesses. As a result, the Penang People's Report was published in 1999. After a decade of formulation, Penang's rapid growth and urbanization spurred the demand to revisit SPI. On that note, Khazanah Nasional, the Penang Socio-economic Research Institute (SERI) and Universiti Sains Malaysia are jointly organising the SPI II Workshop and roundtable discussions on six key areas: City as a Living Space, City as a Transaction

Hub, City as a Knowledge Hub, City as a Civic and Democratic Space, City as a Cultural Hub and City as a Sustainable Space. The cross sectoral issues of SPI II have attracted different stakeholders such as resident associations, environmental NGOs, students of higher education institutions and local government representatives to participate in the roundtable discussions. The outcomes of the roundtable discussions will serve as a basis for formulating and recommending action plans to the Penang state government.

5.4.4 Regional Centre of Expertise (RCE) Penang@USM

332 Universiti Sains Malaysia is the secretariat for the Regional Centres of Expertise (RCE) on education for sustainable development (ESD) which received recognition by UNESCO in June 2005. Since its formal inception, RCE Penang has been consolidated from a loose university-based (originally environment-based) and in-campus initiative, into a structured, broad-based and semiformal network of ESD-related stakeholders. Although Universiti Sains Malaysia continues to play a leading role in this initiative, it is essentially run by a committee of stakeholders and co-chaired by a member of the community. More specifically, Universiti Sains Malaysia has a formal collaborative arrangement with ten civil society organisations in championing the cause of sustainability as a partnership extension, in an “inside-out” approach, involving players outside the university (Abdul Razak & Mohamed, 2008).

333 RCE Penang@USM has brought together a wide range of NGOs, organisations and individuals who are actively involved in sustainable development-related activities at local, regional and international levels. Since its establishment in 2005, RCE Penang@USM has organised many workshops, projects and consultations on various themes of environmental sustainability.

5.4.5 Community Outreach Programmes

334 There have been many community outreach programmes which originated from research projects conducted by researchers from Universiti Sains Malaysia. The examples are the Going Bananas: A Lesson on Sustainability and Worm Composting project as well as the educational and promotional services to the community on energy efficiency and renewable energy. These projects are examples of the major attempts made in promoting projects that bridge the university and community. The idea is to transfer the university’s R&D products to the community to benefit the region and society (Abdul Razak & Mohamed, 2008).

335 The idea of the Going Bananas: A Lesson on Sustainability project is to ‘recycle’ the entire banana tree. This project is an example of a transdisciplinary project bringing together the university’s staff from different disciplines such as industrial technology, arts, humanities and social sciences. A community on Penang Island was chosen as the “adopted village” to carry out the activities with the aim of generating economic income for the community while conserving the environment.

336 This community project was launched by the Governor of the state of Penang on 29 June 2008 in Kampung Perlis, Balik Pulau. The project was initiated to deal with three main issues faced by the village community in the area: the availability of idle fertile land, monkeys swarming the area and the abundance of banana trunks left to rot. The state representative believes that this Going Bananas project is the answer to address the said issues. It will help to improve the income level of the community involved, and hence indirectly alleviate poverty within the community. The concept of creating wealth from waste is a most viable idea, and this is made possible with the help from experts from Universiti Sains Malaysia.

337 The project started in early 2007 with a budget of RM20,000 from the state representative as the initiator of the project. Universiti Sains Malaysia, in recognising this initiative, has contributed approximately RM600,000 to build a concrete building (40’ x 90’) using fibre concrete, and specially

designed by a researcher from the School of Housing, Building and Planning. The complex has the capacity to execute three projects simultaneously, namely, making paper and crafts from banana trunks, developing tissue culture for a new generation of bananas and making banana flour, and thus upgrading this Going Bananas project to the next level. Without a doubt, this programme represents an excellent case of how community leaders and experts from higher education institutions can work together to improve the livelihood of the local community through the generation of economic activity while conserving the environment at the same time.

338 The Worm Composting project uses technology developed by scientists from Universiti Sains Malaysia to assist the community in producing compost using wastes from paddy, cow dung and general waste from the village. Since the project commenced, it has benefited the community by increasing the village income by up to 100% (Abdul Razak & Mohamed, 2008). Interestingly, the same technology was also promoted at the Koperasi Tadika Minden, a kindergarten that operates in Universiti Sains Malaysia, for educational purposes.

339 Universiti Sains Malaysia's Centre for Education, Training and Research in Renewable Energy and Energy Efficiency (CETREE) provides educational and promotional services to the community on energy efficiency and renewable energy. Apart from providing textbooks to schools to teach about renewable energy, the centre through its mobile unit has introduced the subject of renewable energy and energy efficiency to 2.5 million school children nationwide. CETREE has also carried out programmes through its mobile unit for 150,000 members of the public via community centres (Abdul Razak & Mohamed, 2008).

340 In addition to the above, Universiti Sains Malaysia is also involved in providing field exposure and raising the awareness level of young students on the importance of water resources, and the impact of activities in river basins on the ecosystem (anthropogenic water pollution) and the associated environmental problems. The School of Management and School of Civil Engineering along with UNESCO Malaysia organised the "Sg. Sedim-Sg. Pinang Expedition 2008: Capacity Building for Early Youngsters 'River is for Keeps'" project. This outreach programme involved 49 students and five teachers from the Pauh Jaya Primary School (Sekolah Kebangsaan Pauh Jaya). This programme aimed to promote the ways to conserve and manage limited water sources in appreciation of nature. From amongst the school children who participated, organisers hoped to create a team of 'cadres' who will promote river management and become role models to their peers and community (Abdul Razak & Mohamed, 2008).

5.5 Conclusion

341 Interestingly, the concept of region as espoused in this study has opened up an avenue to assess the contributions of higher education institutions to the social, cultural and environmental development of Penang from the inside out (from the perspective of the university to the community). This is significant as the objectives of Malaysian universities have always been more focused on contributions to the socio-economic fabric of the nation and less on the impact on the immediate region (state). The analysis presented in this chapter reveals many strengths, weaknesses, opportunities and threats that can be further explored by stakeholders to strengthen the university-local community-government linkage as conceptualised in the triple helix model of the university-region relationship.

342 Higher education institutions in Penang must continue to work hand in hand with the community to ensure that the social, cultural and environmental developments in the region are sustainable. This way, Penang will continue to flourish and this will benefit both higher education institutions and the local communities.

Table 5.1 Strengths, weaknesses, opportunities and threats

Strength	Weakness
<ul style="list-style-type: none"> • Strong local NGOs that initiate and sustain social, cultural and environmental activities at the grass-roots level • Universiti Sains Malaysia as a sustainably led university will continue carrying out projects and activities with the community in the region • The community benefits from innovative research such as better health services 	<ul style="list-style-type: none"> • Rapid urbanisation poses significant adverse socio-economic and environmental effects • Individual level activities seldom receive proper institutional recognition and support • Unsustainable top-down ad hoc research projects • Lack of inter-faith and inter-ethnic activities to promote interaction between the region's multi-ethnic population
Opportunity	Threat
<ul style="list-style-type: none"> • Higher education institutions could play a bigger role in regional development • Long-term collaborations with local communities • Action-based research for greater local engagement 	<ul style="list-style-type: none"> • Lack of awareness on conservation and preservation • Increasing pollution as the region experiences development

Source: Authors

5.6 Emerging Issues

343 In a nutshell, rapid urbanisation has posed significant adverse socio-economic, cultural and environmental effects on the state of Penang. Therefore, to further promote and ensure sustainable development in the region, higher education institutions need to increase their long-term collaborations with local communities through their three-core mission of teaching, research and service. Significant emerging issues, in the context of the discussion in this chapter, are as follow:

1. Higher education institutions need to increase community education, advocacy and action-based research for greater local engagement and promotion of sustainable lifestyles in the region.
2. Penang is slowly losing its cultural assets due to the rapid economic development. There should be more collaboration between higher education institutions, local specialists and agencies in encouraging more artistic ability and creativity in the region, allowing the community at large to learn and appreciate the arts and culture even as the state economically progresses forward.
3. Penang is suffering from human activities such as rampant hill development, industrial pollutions and traffic congestion. Thus, ESD is an essential element in the growth of Penang as a city-region. Collaborations between local stakeholders and higher education institutions on adhering to the best practices for sustainable development should receive proper institutional recognition and support.

CHAPTER VI: CAPACITY BUILDING FOR REGIONAL COOPERATION⁶

Introduction

344 In the past, higher education institution engagement with the community and industry was seen as an auxiliary function, with the core business of the higher education institution centred on teaching and research. However, the recent scenario in the educational landscape has witnessed a major shift in the role of higher education institutions which has placed regional engagement as one of their prime agenda alongside teaching and research in an attempt to construct a better future for the nation. Clearly, regional engagement offers enormous benefits to both higher education institutions and their stakeholders. Through regional engagement, the institutions would be able to assist with specific research, encourage volunteer service, and offer student internships and training programmes to community groups. On the other hand, external stakeholders can bring business to the institutions through incentives for research, and opportunities for consultancy and training. It is through these locally based partnerships that institutions are able to secure the economic prosperity, socio-cultural well-being and environmental sustainability of the region. Clearly, regional engagement promotes a win-win situation for both the region and its higher education institutions. Productive partnerships between the two will help further the region's interests and higher education institutions' strategic ambitions.

6.1 Existing Formal and Informal Mechanisms

345 Higher education institutions in Penang engage the community in the region in varying ways. Some higher education institutions, especially those which are government-funded, have formal mechanisms in the form of special divisions set up to link the institutions with the community and industry. Others do engage with the industry or community but they do not seem to have any formal divisions/departments that specifically oversee the engagement.

346 In Universiti Sains Malaysia, the division responsible for such engagement is known as the Division of Industry and Community Network (BJIM). BJIM functions to match the knowledge/expertise, facilities and resources of the university with the needs, aspirations and expectations of the industry and community to result in a win-win situation. BJIM has the following objectives:

- to act as a one-stop referral centre or gateway for the industry and community;
- to ensure that linkages and partnerships with the industry and community are meaningful, effective, sustainable and well coordinated;
- to provide the industry and community with a comprehensive database of the expertise, facilities and resources available at Universiti Sains Malaysia; and information on new inventions, innovations, discoveries, technologies and activities of the university;
- to further enhance and strengthen existing linkages and partnerships, and establish new ones not only at the local and national level, but also at the international level;
- to engage in dialogues with the state, industry and community so as to ensure that the teaching programmes and research efforts are relevant to their needs, aspirations and expectations, without sacrificing the fundamental mission of the university; and
- to guide and lead the industry and community towards sustainable development, advancement and transformation.

347 Apart from BJIM, there are other mechanisms which have been employed to foster linkages such as through the Research and Innovation Office, USAINS Holding Sdn. Bhd. (the consultancy arm of the university) and individual schools.

348 Another government-funded university in Penang, Universiti Teknologi Mara (UiTM) Penang, has a centre called the Centre for UiTM-Industry Linkages and Commercialisations (UILC). The centre was established in 2003 with the aim of fostering better linkages between the university and industry which UILC considers necessary, in view of not only the possible mutual gains for both parties but also the immense benefits towards nation building and the wider economy.

349 The other university in Penang, Wawasan Open University (WOU), does not seem to have any specific centre or division that deals with such linkages.

350 Despite this, all the three universities, through their respective mechanisms, have undertaken various collaborations and memorandum of understandings (MOU) with external agencies. Tables 6.1, 6.2 and 6.3 below display some examples of the collaborations and MOUs involving Universiti Sains Malaysia, UiTM and WOU respectively.

Table 6.1 Examples of memorandum of understandings (MOU) and collaborations between Universiti Sains Malaysia and other agencies in the Penang region

Category	Agency	Detail of Engagement	Impact	Outcome
Research collaboration	1 Malaysian Institute of Accountants (MIA) and Malaysian Accountancy Research and Education Foundation (MAREF)	Provision of reports on the business advisory services' impact on the success of small and medium enterprises (SME)	Offer of training to SMEs	Monograph and case report
	2 Northern Corridor Implementation Authority (NCIA)	Conducting of studies pertaining to the electrical and electronic (E&E) industry in the Northern Corridor Economic Region (NCER)		
	3 Multimedia Technology Enhancement Operations (METEOR) DOC. Sdn. Bhd.	Sharing of resources, knowledge and expertise to provide graphic designing services, desktop publishing works and printing solutions to clients in the northern region of Malaysia		
	4 Penang Regional Development Authority (PERDA)	Provision of research consultancy on durian-based drinks		

Category		Agency	Detail of Engagement	Impact	Outcome	
Education and teaching collaboration	1	Universiti Sumatra Utara, Prince Songkhla University and BINUS Nusantara University	Exchange of expertise for regional development (the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT))	Transfer of knowledge	Development of skills and knowledge	
	2	Motorola (M) Sdn. Bhd.	Staff exchange for industrial and academic exposure			
	3	Private higher education institutions (e.g., Stamford College, Island College of Technology and Disted College)	Provision of franchise programmes			
Consultancy collaboration	1	Ministry of Energy, Water and Communications (MEWC) and NCIA	Adoption of the next generation internet	Improvement of the information technology infrastructure	Model of next generation internet	
	2	Asas Architects Sdn. Bhd.	Provision of operation services for the centres of excellence for E&E design, and restoration and conservation works			
Training collaboration	1	Intel Technology Sdn. Bhd.	Provision of training and exposure through various applications/software tools related to multi-course architecture	Skills development	Development of skills and knowledge	
	2	Penang state government	Provision of oral and written English courses for support staff			
	3	Agilent	Inculcation of the atmosphere of achieving top performance through positive work culture			Motivation
	4	Schools in Tasek Gelugor	Provision of language excellence and enrichment programmes			Skills development

Sources: Universiti Sains Malaysia, Annual Report (2007); Division of Industry and Community Network, Universiti Sains Malaysia (2009); various unpublished sources

Table 6.2 Examples of memorandum of understandings (MOU) and collaborations between Universiti Teknologi Mara and other agencies in the Penang region

Category	Agency	Detail of Engagement	Impact	Outcome
Research Collaboration	Veterinary Research Institute	Determination of the radio frequency electromagnetic field effects due to wireless phones, global system for mobile communications (GSM) base stations, and wi-fi and bluetooth devices	Public awareness towards the dangers of radio frequency electromagnetic fields	Monograph/research report
Training collaboration	Penang Contractor Service Centre (in-progress)	Provision of short courses	Transfer of knowledge	Development of skills and knowledge
	Pearson	Provision of workshops on professional publishing	Transfer of knowledge	Development of skills and knowledge

Source: Wan Maznah (2009)

Table 6.3 Examples of memorandum of understandings (MOU) and collaborations between Wawasan Open University (WOU) and other agencies in the Penang region

Category	Agency	Detail of Engagement	Impact	Outcome
Consultancy collaboration	Firms in the industry	Provision of training needs analyses and delivery of training	Transfer of knowledge	Development of skills and knowledge

Source: Teoh (2009)

351 As indicated above, higher education institutions in Penang do engage with the industry and community in the Penang region in various forms of collaboration.

352 Another form of collaboration is student industrial training. Penang has a number of organisations such as multi-national corporations (MNC), software houses and government agencies that can provide suitable venues for students to undergo industrial training. At Universiti Sains Malaysia, these organisations are given the opportunity to conduct interviews with both the final year students for possible employment and those who are due to undergo their industrial training. The School of Computer Sciences normally arranges these interviews for more than ten different organisations each year. Majority of these organisations are based in Penang.

353 The School of Computer Sciences is one of the most active schools (in Universiti Sains Malaysia) in promoting industry and community engagement. For example, the school organised a seminar entitled the “Industrial Training Seminar” which allowed organisations to brief students on the available training. Three organisations were invited: Intel Penang, representing the MNCs; the Software Consortium of Penang (SCoPe); and Universiti Sains Malaysia’s Pusat Pengetahuan, Komunikasi dan Teknologi (PPKT), representing the government agencies. In addition to placing students in industrial training at the industry, the school also receives a number of trainees from various institutions including public and private universities, community colleges and polytechnics located in the region.

354 The school also works closely with the state government in promoting sustainability. For instance, in promoting the recycling concept, the school launched the recycle campaign together with the Municipal Council of Penang Island (MPPP) to encourage recycling among staff and students. The council generously lent the university a set of recycle bins and they were placed at the school for easy access to both students and staff.

355 In the field of information and communication technology (ICT), the school’s contribution is highly acknowledged. An emerging topic in computer networking is the next generation internet that looks at future technologies in the area of computer networks. Being recognised as an expert in the area of computer networks both locally and internationally, one of the research centres at Universiti Sains Malaysia, the National Advanced Internet Protocol version 6 Centre (NAv6), has been appointed by MEWC (currently known as the Ministry of Green Technology and Water) to undertake the task of introducing and creating awareness on the subject of the next generation internet. NAv6 has also been entrusted to help organisations in deploying Internet Protocol version 6 (IPv6) in their network infrastructures. As a pilot project for the deployment of IPv6 among government agencies, the centre has worked with two government organisations: MEWC and the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU).

356 In addition to individual regional engagements, the three universities mentioned //above (Universiti Sains Malaysia, UiTM and WOU) are also currently involved in a collaborative project known as the Penang Cultural Heritage Project which began in March 2010. Initiated by Universiti Sains Malaysia, the potentially long-term project is purposed to help preserve, rediscover, document and disseminate the cultural identities of the people of Penang as well as promote the cultural elements as a tourist attraction. As part of the project activities, a Penang folklore awareness workshop was held on 12 May 2010 involving school teachers, members of non-governmental organisations (NGO) in Penang, personnel from the tourism industry, academicians and the general public. The project demonstrates that higher education institutions in Penang have a strong sense of social responsibility and are ready to collectively help and work together with the community in the region. Universiti Sains Malaysia acts as the coordinator and leader of this project while UiTM and WOU assist in terms of intellectual contribution and manpower needs.

6.1.1 The Role of Higher Education Institutions in Penang’s Strategic Plans

357 Higher education institutions act as a key player in the region’s strategic plans. Higher learning institutes in Penang are regarded as a form of edu-tourism to attract tourists to the state by providing education and training at competitive rates. These institutions are also included in the strategic plan to promote research excellence. Universiti Sains Malaysia in particular, is considered a centre of excellence or leader in several fields such as biotechnology, microelectronics, cancer, cardiology and dentistry. Table 6.4 below displays some examples of the roles of Universiti Sains Malaysia in the region’s strategic plans.

Table 6.4 Roles of Universiti Sains Malaysia in the region's strategic plans

No.	Region's Strategic Plan	Role
1.	Socio Economic Framework Action of Northern Corridor Economic Region 2007–2025 (Sime Darby Bhd, 2007)	<ol style="list-style-type: none"> 1) Leader for biotechnology research in Malaysia 2) Establishment of a microelectronic centre of excellence focusing on research and postgraduate studies
2.	Penang Structure Plan 2020 (JPBD, 2007)	<ol style="list-style-type: none"> 1) Commercialisation of Universiti Sains Malaysia products 2) Development of the Advance Medical and Dentistry Institute (AMDI) at Universiti Sains Malaysia in Bertam as an advanced research centre for cancer and cardiology 3) Development of the Centre for Marine and Coastal Studies (CEMAC) at Universiti Sains Malaysia as an expert body for land embankment in Penang
3.	Inspection Report on Penang Structure 2005–2020 (JPBD, 2005)	<ol style="list-style-type: none"> 1) Supplying of highly skilled manpower including engineers and information technologists 2) Development of AMDI at Universiti Sains Malaysia in Bertam as a renowned research centre in the northern region 3) Dissemination of information and education to people in Penang 4) Development of Universiti Sains Malaysia's Marine Research Station in Muka Head, Penang so as to establish Penang as a marine biotech centre 5) Declaration of Universiti Sains Malaysia and its surroundings as Penang Cybercity (PCC) 1
4.	Biopharmaceutical roadmap	Preparation of the biopharmaceutical roadmap for the northern region initiated by InvestPenang
5.	Sustainable Penang Initiative II — Penang Eco-town Project	Main steering committee member in developing a framework for sustainability in Penang especially on environmental issues

Source: Variuos sources

358 It should be noted that at this juncture, all higher education institutions in Penang play a key role in the National Higher Education Strategic Plan 2007–2010. They are needed to contribute in the promotion of widespread economic growth, and high moral and social values.

359 The importance of higher education institutions in the region is also emphasised in the Penang Structure Plan 2020, 9th Malaysian Plan and Strategic Plan 2009–2015. In the Penang Structure Plan 2020, the following strategies are mentioned:

- increase and encourage cooperation between higher education institutions to ensure that there is no overlap in the courses offered;

- conduct a comprehensive study and decide a strategic plan for the private higher education industry;
- promote Penang as an education centre of excellence for public, private and other higher education institutions;
- increase *bumiputera* participation in higher education;
- consolidate and increase the facilities provided at private higher education institutions; and
- encourage the involvement of private sectors in providing facilities for pre-schools and higher education institutions.

As for the 9th Malaysian Plan, the following strategies are noted:

- to undertake comprehensive improvement of the education system, from the pre-school to tertiary level, from the aspects of curriculum and teaching to school facilities, with a special focus on raising the standard of schools in rural areas;
- to reduce disparities between the rural and urban population, and the conditions among states and regions via sustainable income generating avenues and improving access to basic needs such as housing, education, healthcare, utilities and transportation;
- to promote trade and tourism, including health and education tourism to benefit from the improvements in air links and sea routes within the IMT-GT; and
- to allocate RM1,650.5 million for education and training in Penang.

The Strategic Plan 2009–2015 similarly has the following as one of its strategies:

- to provide improved chances of organisation attachment by increasing the number of officers with postgraduate qualifications through the increase in the provision of higher education opportunities

6.1.2 Resources to Support Regional Engagement

360 Universiti Sains Malaysia receives government funding to promote and support regional engagement through BJIM. In 2008, BJIM received RM306,414.08 and in 2009, RM524,166.98. The funds provided are meant to be used for conducting various community- and industry-related programmes such as workshops, conferences and forums. In 2008, BJIM conducted 38 industry- and community-based programmes. Table 6.5 below is a summary of those programmes carried out.

Table 6.5 Activities carried out by the Division of Industry and Community Network (BJIM) in 2008

No.	Programme	Organisation Involved
1.	Workshop	Fuji Electric (M) Sdn. Bhd.; Hi-Tech Instruments Sdn. Bhd.; Institute for Research in Molecular Medicine (INFORMM) and Innovation Office, Universiti Sains Malaysia; and Waseda University, Japan
2.	Collaboration research/dialogue/project	Basechem Industry Sdn. Bhd., Selangor; MKN Group Sdn. Bhd.; Finisar Malaysia Sdn. Bhd.; and Eight Media Industries
3.	Talk	Alumni, Universiti Sains Malaysia; Datuk Vinod Balachandra Sekhar (President and Chief Executive of the Petra Group, and Chairman of the Sekhar Foundation); and NCIA
4.	Conference	Participants from various higher education institutions in Malaysia
5.	Seminar	Professor Markus Zahn, Massachusetts Institute of Technology (MIT)
6.	Short course	Topic on activated carbon for managers, engineers, researchers, chemists and technicians
7.	MOU	Australian Cranio-Maxillo Facial Foundation (ACMFF), Siemens Malaysia Sdn. Bhd. and Khazanah Nasional Bhd.
8.	Social service and community-based project	Local communities around Universiti Sains Malaysia's main campus and branches
9.	Visit	Collaborative Microelectronic Design Excellence Centre (CEDEC) and National Instruments, United States of America
10.	Survey	Khazanah Nasional Bhd.

Source: Division of Industry and Community Network

6.1.3 Processes in Place to Regularly Review Current Engagement Arrangements between Higher Education Institutions and the Region

361 There are no formal structures or processes in place to regularly review current engagement arrangements between higher education institutions and the region. However, in Universiti Sains Malaysia, engagements between the university and region are coordinated by BJIM and in UiTM, by UILC. Both BJIM and UILC seek to ensure that linkages and partnerships with the industry and community are meaningful, effective, sustainable and well coordinated.

362 To help evaluate the success of Universiti Sains Malaysia in regional engagement, the university appoints industry advisory panels (IAP) to provide input on various aspects including the improvement of university and regional linkages.

6.1.4 Use of Infrastructure

363 Higher education institutions in Penang have always made available their infrastructures to enhance community and industry engagement. The infrastructures are in the form of collaborative research, joint training programmes and social events.

6.2 Promoting Regional Dialogues and Joint Marketing Initiatives

6.2.1 Existing Mechanisms to Promote Communication and Dialogue between Higher Education Institutions and Regional Stakeholders

364 To promote communication between higher education institutions and regional stakeholders, some initiatives have been introduced. Programmes such as joint collaborations, workshops and knowledge transfers are held where both parties will contribute their knowledge and expertise for mutual benefit.

365 One such initiative is the IAP. Members of the IAP consist of representatives from the industries including MNCs and SMEs, and government agencies. The panel engages dialogues with higher education institutions to discuss the needs and directions of the industries. Such dialogues are useful to higher education institutions for the reviewing, improving and designing of their curriculum.

366 Other initiatives such as joint research and development (R&D) projects with the industries and regional dialogues or forums on current issues facing the region are also actively undertaken by higher education institutions and other state government agencies. These initiatives serve as platforms to bring field experts together to discuss and exchange ideas for regional benefits.

6.2.2 Higher Education Institution Staff Representation on Public/Private Bodies in the Region

367 Higher education institutions have always been supportive of the idea of sharing the expertise of their staff with the public and private bodies in the region. The staff representation ranges from conducting R&D projects to setting policy direction and monitoring projects, to sitting on boards of local councils, private firms and innovation centres.

6.2.3 Role of External Bodies in the Decision Making of Higher Education Institutions

368 External bodies including advisory panels, external assessors and visiting professors contribute significantly to the higher education institution's curriculum planning and training, policy review and future direction. For Universiti Sains Malaysia, representatives from the government (both federal and state) and elected members from the Ministry of Higher Education (MOHE) sit on the university's Board of Directors. Their views and inputs help shape the university's present and future landscape. By listening to and understanding the needs of the external bodies, the essential elements needed to enhance industry relevance can be incorporated into the university's curriculum more effectively.

6.2.4 Joint Promotion and Marketing Initiatives

369 Generally, higher education institutions organise promotion and marketing initiatives on their own with some cooperation from external parties such as MOHE and the state government. These initiatives include education and R&D fairs, exhibitions and road shows, with the objectives of promoting and scouting for prospective students and human resources as well as showcasing research expertise.

6.2.5 Strategic, Organisational, Managerial or Academic Changes in Higher Education Institutions to Improve Performance

370 Higher education institutions, from time to time, do review their curriculum in order to keep up with the ever changing environment and circumstances. Universiti Sains Malaysia invites external examiners and advisory panels to review and give recommendations to improve its curriculum. However, any changes to the curriculum are still subjected to the approval of MOHE.

6.3 Evaluating and Mapping Out the Impact of the Regional Higher Education System

6.3.1 Audits of Impacts on and Links with the Region

371 Currently, there are no formal assessments or processes in place to evaluate the impacts on and links with the region.

6.3.2 Mechanisms to Raise Awareness on the Roles of Higher Education Institutions in the Region

372 Higher education institutions employ a number of mechanisms to raise the awareness of all parties on the institution's roles in the region. These include the establishment of the Industry and Community Linkages Unit in public universities. Private higher education institutions, on the other hand, have informal mechanisms to achieve this objective through student and staff exchange as well as social events.

373 Universiti Sains Malaysia houses the Regional Centres of Expertise (RCE) on education for sustainable development (ESD) within its campus. RCE Penang@USM has been actively promoting awareness on ESD among the university community and the region through seminars and workshops. Among the participants are the Department of Environment, Penang state government, MPPP and NGOs such as the Social and Environmental Research Institute (SERI), Sahabat Alam Malaysia (SAM), Malaysian Nature Society (MNS), Consumer Action of Penang (CAP), Third World Network, Pesticide Action Network-Asia Pacific, Penang Environmental Working Group (PEWOG), Centre for Education, Training and Research in Renewable Energy and Energy Efficiency (CETREE), CEMAC, Centre for Archaeological Research-Malaysia and the Museum, River Engineering and Urban Drainage Research Centre (REDAC), Women's Development Research Centre (KANITA) and Basic Education Research Unit (BERU).

374 One of the most recent mechanisms that has been set up is the Science and Arts Innovation Space (SAINS@USM) which serves as a research centre, tourist attraction and public park. It represents an innovative space that promotes integrated research with advanced incubators and laboratories.

6.4 Institutional Capacity Building for Regional Involvement (for each higher education institution in the region)

6.4.1 Changes in the Higher Education Institution Leadership to Meet Regional Needs

375 Universiti Sains Malaysia's transformation plan, entitled "Transforming Higher Education for a Sustainable Tomorrow" focuses, among other things, on diagnostics, medical biotechnology, waste management, pharmaceuticals, nanotechnology, carbon nanotube, membrane technology and vaccinology. Universiti Sains Malaysia's strategy is to make competition irrelevant (Blue Ocean Strategy) and emphasise on innovation (in product, service or delivery) that raises and creates value whilst reducing or eliminating any service or delivery that is of less value for the current and future market.

6.4.2 *Relationship with the Regional Community as a Strategic Plan for Enhancing Viability*

376 There is awareness among higher education institutions that they have to match their knowledge/expertise, facilities and resources to the needs, aspirations and expectations of the industry and community to remain viable in the long run. This is reflected in the design of their curriculum as well as the management structure.

6.4.3 *The Higher Education Institution Internal Mechanisms to Coordinate Regional Involvement in Relation to Funding*

377 Public higher education institutions generally have a division to manage the funding of research projects which usually includes regional involvement. In Universiti Sains Malaysia for instance, such an effort is managed by the Research, Creativity and Management Office (RCMO). There are no internal mechanisms specifically to coordinate regional involvement in relation to funding.

6.4.4 *Use of Adjunct Appointments to Add Expertise*

378 Visiting professors, and advisory and industry panels are appointed to add expertise to the available human resource.

6.4.5 *The Higher Education Institution Response to Regional ICT Infrastructure*

379 Higher education institutions are generally responsive to regional ICT infrastructure. One example of the response is technology transfer. Universiti Sains Malaysia, through CEDEC, has signed a collaboration agreement with Advance Information Delivery and Access Solution (AIDAAS), a company which develops new technology in the broadband infrastructure with researches from Ukraine.

6.5 Human and Financial Resource Management (for each higher education institution in the region)

6.5.1 *Regional Dimension in the Higher Education Institution Human Resource Management*

380 In Malaysia, educational provision falls under the purview of the federal government. The Malaysian Constitution, under the 9th Schedule Legislative List, clearly specifies that education — “elementary, secondary and university education; vocational and technical education; training of teachers, registration, and control of teachers, managers and schools; promotion of special studies and research; scientific and literary societies” (paragraph 13, the Malaysian Constitution) — are all registered under the federal list. The state duties are more focused on land management, agriculture and forestry, local administration, services for local charters, state works and water, machinery of the state government and state holidays. Education, in Malaysia, has always been regarded as one of the federal fiscal tools. All education-related policies from funding to student selection are under the jurisdiction of the federal government, in particular, MOHE.

381 Higher education institutions in Malaysia are spread across many states and regions. The state government has no direct influence over higher education institutions although a state representative may sit on the university board by invitation. At best, cooperation between higher education institutions and the state government exists on an ad hoc basis, as and when the state government needs particular help from the higher education institutions. Even the hiring and recruitment policies at higher education institutions are governed by federal rulings. Given such background, human resource policies at any public higher education institution do not have regional dimensions incorporated into them.

382 Occasionally, there will be a need for the state government to work together with higher education institutions on certain state-based projects which require experts from the institutions. The experience from the projects will expose the participants (experts from higher education institutions) to issues confronting the state government. Beyond the projects, there are no formal procedures or attempts to incorporate regional engagement into the operations of higher education institutions.

6.5.2 *Regional and National Funding Management*

383 All public higher education institutions receive funding directly from the federal government with some allocation for regional engagement. However, there is no regional funding from the state government as the state also partly depends on the federal government for the financing of major projects, particularly, infrastructure development projects.

6.5.3 *New Source of Funding for Higher Education Institution-Regional Involvement*

384 In general, higher education institutions are always on the lookout for new sources of funding. There is no systematic formalised arrangement that governs this area. In 2007, Universiti Sains Malaysia was chosen to be the first representative of the Accelerated Program for Excellence (APEX) scheme where the possibility of having financial decentralisation within the university is likely to happen. However, since this is the first ever attempt by the Malaysian government to introduce a new concept of building a world-class university, much remains to be seen. The move to make Universiti Sains Malaysia an autonomous university entails a number of major obstacles especially moving away from the civil service mentality. The move could trigger many bureaucratic problems as well as operational difficulties involved in converting a public university to an autonomous institution of higher learning. For the federal government, the autonomy could introduce the dilemma of wanting to keep Universiti Sains Malaysia under their control, but also not wanting to restrict the university in exploring the limits in its journey in attaining world-class recognition. Should this autonomy issue be solved, Universiti Sains Malaysia would be able to engage in more regional and sustainable development in the university's bid to differentiate itself from other leading universities in the world.

385 Maintaining George Town's United Nations Educational Scientific and Cultural Organisation (UNESCO) World Heritage status requires effective initiatives such as tourism development, town planning (in building regulations), and research and innovation. Challenges such as the issue of compliance with building regulations to preserve socio-economic elements (of the human culture and communities within the enclaves) will arise. Overcoming such obstacles would require greater cohesion and cooperation between Universiti Sains Malaysia and the state government, and thus promoting regional engagement.

386 Resources generated from activities such as cultural heritage tourism could be used to finance more research projects under the regional engagement agenda. At the moment, there are no formal mechanisms in place in regards to the regional funding of engagement activities. The concept of regional engagement is yet to be fully embraced by the city of Penang and other regions in Malaysia.

6.6 *Creating a New Organisation Structure*

6.6.1 *Cultural Obstacles to the Higher Education Institution-Regional Involvement*

387 There are a few cultural obstacles hindering greater regional engagement within higher education institutions:

- (1) lack of awareness among the higher education institution community pertaining to the importance of regional engagement;

- (2) lack of readiness among the higher education institution community to systematically engage with the community/region;
- (3) lack of recognition of regional engagement in the promotion exercise at higher education institutions (the challenge is to convince the government and leaders of higher education institutions to integrate regional engagement activities in the promotion scheme); and
- (4) lack of emphasis on community engagement in the higher education institution ranking system (the ranking system does not take into account community engagement, and thus, making it difficult to entice the higher education institution community to take part in regional engagement).

6.6.2 Higher Education Institution-Regional Involvement in the Higher Education Institution Mission

388 Despite the said obstacles, some higher education institutions in the region have continued to intensify their regional collaboration activities. Universiti Sains Malaysia for instance, has demonstrated its commitment to play an active role in regional engagement and sustainable development. This commitment has been made explicit via its mission statement. The statement indicates that the university aspires to lead and innovate in achieving excellence at the international level through advancing and disseminating knowledge and truth, instilling qualities that stress academic excellence and professionalism, developing holistic individuals, and providing a strong commitment towards society's aspirations as well as the country's vision and universal aspirations. The blueprint entitled "Transforming Higher Education for a Sustainable Tomorrow" that was launched in 2008 outlines the future strategies of the institution. The strategies aim at generating and creating talent and quality knowledge, uplifting the bottom billions of the socio-economic pyramid as well as protecting the ecosystem. Similarly, a few private higher education institutions in the region have also propagated their intentions to contribute to the educational, economic, human resource, technological, socio-economic and cultural development of the nation while preserving ecological sustainability.

389 Evidently, in charting the path towards regional engagement and sustainable development, higher education institutions need to focus on promoting a new organisational culture. In the context of Universiti Sains Malaysia as one of the higher education institutions in the region that values such agenda, the ingraining of the following culture is seen as crucial:

- (1) encouraging the fusion of science and arts, and transdisciplinary approaches through the formation of research clusters;
- (2) encouraging community engagement in participatory projects/research that requires a balance between promoting science and technology, and arts and humanities;
- (3) establishing cutting-edge research programmes to address the issues of the population at the bottom of the socio-economic pyramid (local and international);
- (4) concentrating on research outcomes that will reduce inequity and enhance sustainability which may include the availability, affordability, accessibility and quality of education for those who need it most — those among the bottom billions;
- (5) creating a balance between the economic and social needs such as conducting research to enhance humanity, and
- (6) inculcating environmental awareness towards protection of the ecosystem through seminars, workshops, talks, campaigns and other various programmes.

390 In order to succeed in regional involvement, higher education institutions need to initiate a process of internal reform to strengthen the management capability and integrate regional engagement and sustainability into its core activities. The formation of BJIM and the establishment of the Corporate and Sustainable Development Division (CSDD) at Universiti Sains Malaysia demonstrate the institution's seriousness in pursuing this agenda. In addition, the launch of the "Education for All" Program that encourages lifelong learning amongst Malaysians clearly denotes the institution's efforts

in achieving successful regional engagement. The “Education for All” Program includes initiatives such as the Warga Emas Program, Warga Orang Kurang Upaya (OKU) Program, Warga Sukan Program as well as the “Citizenship Project” (that aims at developing citizenship and community membership skills). A higher recognition by the university’s management of its staff’s community involvement could well enhance and strengthen the university’s efforts in regional engagement.

391 Notably, in fulfilling the regional engagement and sustainable development plans, strong support from the federal government is crucial. Among the major issues that demand immediate attention are educational, administrative and financial autonomy, and a new system of governance. Without such empowerment, it is hard for higher education institutions to actively contribute towards the community and the nation at large.

6.7 Emerging Issues

392 By way of conclusion, the following are the emerging issues in capacity building for regional cooperation:

1. there are no formal structures or processes in place to regularly review the engagement arrangements between higher education institutions and the region,
2. there is no concerted effort (master plan) to build the capacity for regional development among the higher education institutions, state agencies and private sectors in the region; and
3. there are cultural obstacles hindering greater regional engagement within higher education institutions.

CHAPTER VII: CONCLUSIONS — MOVING BEYOND THE SELF EVALUATION⁷

7.0 Recapitulation

393 This self-evaluation exercise was undertaken with three objectives in mind. First, it was undertaken to provide a comprehensive background on the Penang city-region, emphasising its socio-economic and cultural assets, and the development and changes of these assets over time. The second objective was to determine the extent to which these changes have been the result of the interaction between various forces in the region, in particular, higher education institutions. In this regard, it was pertinent to trace the changes in the region arising from the dynamics and interplay of internal and external forces, and the interactions between various actors and stakeholders. In this respect, we have taken great care to emphasise the role of higher education institutions in bringing about marked changes in the socio-economic and cultural fabric of the Penang region (third objective). Incidentally, there are only two public universities in the state of Penang: the Accelerated Program for Excellence (APEX) status university, Universiti Sains Malaysia and a branch campus of Universiti Teknologi Mara (UiTM), with its main campus operating from Shah Alam near Kuala Lumpur. To fulfill the third objective, many academics and researchers were involved in this self-evaluation exercise. In the process of preparing their reports, these writers were in constant consultation with various stakeholders in Penang, soliciting for ideas and data. Admittedly, many of these writers are experts in their own fields but this was the first time they were analysing and reflecting on their activities in terms of the impact on the local community.

394 Through a thorough analysis of the impact of higher education institutions on the landscape of Penang and by observing the current developments in both spatial and non-spatial terms, we were able to visualize future changes and prospects. Where the role of higher education institutions is concerned, we see these changes as very much related to the increasing importance of Universiti Sains Malaysia (being Malaysia's APEX university). At the same time, we are also conscious of the fact that Penang is going through some very difficult adjustments. The change in the state government in the 2008 general election has shifted focus and attention on other matters which are totally unrelated to economic and spatial development. Thus far, we have seen the fortunes of the private higher education sector decline and the socio-economic foundation of the region's economy restructured. Arguably, all of these developments will directly impact capacity building (not to mention status building) within the region.

395 In the recent past, Penang was integrated with the global economy through its electrical and electronic (E&E) industry, in particular, the production and export of semiconductor products (Morshidi, 2009; Hassan, Morshidi & Md. Harashid, 2006). Arguably, because the production of semiconductor products primarily involves the assembly of semifinished components, the role of higher education institutions in the process is very minimal indeed. This being so, at this stage of the lifecycle of semiconductor products, there is hardly any need for research and development (R&D) activities. However, lately, as the result of significant changes in the global production situation, several industrial upgrading exercises have been undertaken to make Penang relevant to the new developments. The upgrading exercises were very urgent as China and other ASEAN countries were competing with Penang to become the global production location for E&E products. In this regard, Universiti Sains Malaysia, in particular, was called upon to contribute to the industrial upgrading and the subsequent development of hi-tech products. At the beginning, in the context of this new calling, the role of Universiti Sains Malaysia and other institutions of higher learning in the region was primarily to provide human capital to support manufacturing and industrial development. However, lately, the role of higher education institutions in the region has evolved to include community engagement and the promulgation of ideas on sustainability in the region and beyond. While the involvement in community-based issues is not new to Universiti Sains Malaysia, the scale and intensity of the purpose of the current involvement

⁷ Chapter writers: Morshidi Sirat and Norpisah Mat Isa

in this sphere is notable. But, even more notable are Universiti Sains Malaysia's efforts in reconceptualising and disseminating fresh ideas on issues regarding sustainability in connection with the problems of the "bottom billions" and environment.

7.1 Lessons Learned

396 The chapter writers, in preparing this self-evaluation report, engaged various sectors and sections of the Penang community in order to understand and contemplate future patterns and directions. In a way, this has also benefited the chapter writers themselves, for even though they are experts in their own fields, engagement with the community is a new area for them. Indeed, for some, it was an eye opener. Capacity building in community engagement is one of the main benefits of this exercise. This self-evaluation report activity exposed chapter writers to the environment and the local community they operate in.

397 To the Penang community, particularly among the private higher education providers, the participation of public universities (especially an APEX status university) in their deliberations regarding the future of private higher education in Penang is very important. Before this, interaction between the public and private higher education providers was very minimal and probably only occurred at the individual rather than institutional level.

398 Among private higher education providers, the idea that they need to cooperate in order to survive the downturn is very difficult to accept as they have long viewed each other as competitors. This is one of the areas that needs to be looked into in view of the lack of clear direction from the state government.

399 To the local community, there are many local dimensions to the global and regional roles of universities, particularly, an APEX status university. While the APEX university has its sights on global positioning and ranking, it has not neglected its important role in the local community.

400 This self-evaluation report has provided some indication of the future prospects of the Penang region based on the extrapolation of past trends. However, some discerning features of the future are deeply rooted outside the region. University Sains Malaysia for instance, was elevated to a research university in 2006 and then to an APEX status university in 2008, with the mandate from the Ministry of Higher Education (MOHE) that it will become a "world-class" university by 2020. Thus, Universiti Sains Malaysia's plan of action is very much geared towards achieving this objective. Subsequently, everything that is being conducted at the university is based on or guided by several key performance indicators which focus on publications in internationally refereed journals, the amount of grants from external (and international) sources and other factors. Admittedly, while innovation and commercialisation coming out of the universities would drive the region forward into the future, the fruits of these innovative endeavours will almost certainly be felt most outside the region. This is because many of the research and commercialisation activities are externally linked and funded. These external-oriented activities may not benefit the people in the region. This situation needs to be carefully evaluated. However, all is not lost for Universiti Sains Malaysia has recently realigned its focus with the community in mind. The establishment of the Division for Community and Industrial Network (BJIM) at Universiti Sains Malaysia is a clear indication that community engagement is of high priority and activities will be planned and implemented accordingly. Many viable community-based projects and initiatives, which are social, cultural and commercial in nature, are being emphasised. This is because the university believes in pursuing both the tangible (based on key performance indicators) and intangible objectives (based on key intangible performance indicators) in all its activities. However, unfortunately, among private higher education providers, community-based projects are very limited and once again this situation needs to be further investigated.

401 The strategy of developing engagement with the Penang community and emphasising both the tangible and intangible aspects of this engagement is the best way forward for higher education institutions to build and/or strengthen regional capacity. In this respect, we hope to work towards achieving synergy between the aims of Universiti Sains Malaysia as an APEX university and the aspirations of the Penang community.

402 While Universiti Sains Malaysia as an APEX university will continue to contribute to the Penang region in the future, this may not be the case for the private higher education providers. Among the private providers in Penang, the number of institutions offering courses is in decline and total student enrolment is not anywhere near the total enrolment figures in Kuala Lumpur or Selangor. Evidently, most of those that are still operating in Penang are actually feeders to their parent institutions based in the core region of Kuala Lumpur–Selangor. The future will be very challenging for this group of higher education providers for the Kuala Lumpur–Selangor region continues to strengthen its position with new developments such as the Kuala Lumpur Education City (KLEC) in the proximity of the Kuala Lumpur International Airport and knowledge corridor of Bangi–Nilai. In addition, there is also competition from the southern region (Johor) with the development of the Iskandar Development Region and its higher education facilities. The Penang region needs to be as vibrant as the Kuala Lumpur–Selangor region in many aspects in order to attract both international and local students. Penang needs to explore and find its own niche based on the current and future advantages. Admittedly, at this point in time, Penang lacks these advantages. Penang private higher education providers are in dire need of strategic direction from the state government in this matter.

7.2 The Way Forward

403 The state government of Penang has a very important role to play in arresting the sharp decline in the number of providers and student enrolment in the private higher education sector for this sector contributes to local capacity building. While it is acknowledged that higher education is within the purview of the central government, it is highly important that the state government sets clear directions with respect to synergy and collaboration among higher education providers in the region. While the quality of education (interpreted in terms of accreditation, and the standards and outcomes of teaching and learning activities) in the Penang region is of top priority to many stakeholders, we must not forget the importance of factors such as a vibrant regional economy, and a safe and conducive environment with an atmosphere of “happenings” in attracting local and international students to Penang. Arguably, the active promotion of “quality education” in Penang by local stakeholders may not be effective as prospective students may view this as only one element in their complex decision-making process. Comprehensive strategies and initiatives towards the promotion of Penang as the destination for “quality education” must be mapped out and widely circulated to the consuming public. Similarly, positioning in the regional and international market is very important and the private higher education providers need full support from both the state and central machinery to accomplish this. Sadly, all these said elements are lacking at the moment. Admittedly, while higher education institutions have an important role to play in the regional community in terms of capacity building, local authorities have not provided an environment or framework which is conducive for such action at the community level. Notably, at the community level, issues related to politics of confrontation rather than development run supreme.

GLOSSARY

Agilent Technologies Foundation

Agilent spun off from the Hewlett-Packard Company in 1999 as part of a corporate realignment that created two separate companies. Its roots date back to 1939, when Bill Hewlett and Dave Packard started a company that helped shape Silicon Valley and the technology industry. The two founders are renowned for their visionary approach to management (known as the “HP Way”) and commitment to making products that contribute to the advancement of science and technology.

Advanced Micro Devices (AMD)

Advanced Micro Devices (AMD) is a customer-centric innovation company and processing powerhouse that offers smarter choices for its customers and makes technology more accessible to the world. AMD is focused on meeting the needs of leading computing, wireless and consumer electronic companies to help them deliver high-performance, energy-efficient and visually realistic solutions.

Administrative Districts

The administrative districts in the state of Penang are the North-East district (daerah Timur Laut) and South-West district (daerah Barat Daya) on Penang Island; and the Northern Seberang Perai district (daerah Seberang Perai Utara), Central Seberang Perai district (daerah Seberang Perai Tengah) and Southern Seberang Perai district (daerah Seberang Perai Selatan) on the mainland.

Accelerated Program for Excellence (APEX) University

An Accelerated Program for Excellence (APEX) status university is promised autonomy in finance, service schemes, management, student intake, study fees and the determination of top leadership. An APEX university can also offer better terms of service and salary to foreign lecturers to become more competitive despite being under the University and College University Act 1971. However, the governance system for an APEX university is still being developed.

Academic Staff Training Scheme (ASTS)

Universiti Sains Malaysia cordially invites suitably qualified candidates to apply for the Universiti Sains Malaysia Academic Staff Training Scheme (ASTS) in all areas of studies with the exception of Law. Selected candidates will be sponsored by the Ministry of Higher Education (MOHE), Malaysia and Universiti Sains Malaysia to further their studies at the masters and PhD levels at an institution recognised by the Public Services Department, Malaysia. Upon completion of their PhD studies, they will serve as lecturers at Universiti Sains Malaysia.

AIDS Action and Research Group (AARG)

The AIDS Action and Research Group (AARG) based at Universiti Sains Malaysia conducts activities such as AIDS education and awareness campaigns, seminars/workshops, training courses as well as research and counseling services that cater for people in the northern region of Peninsular Malaysia. AARG has recently expanded its services to the southern region by setting-up the Johor AIDS Action and Research Group (JAARG) in 2001.

Alpha Biologics

Alpha Biologics is an independent contract biomanufacturing organisation offering FDA/EMEA cGMP compliant services to the worldwide pharmaceutical and biotechnology industry. The initial process development was undertaken by Alpha's highly experienced team in Cambridge, England before being transferred to the new 5,000 sq metre facility in Malaysia for the final process technology transfer and manufacturing of biologics drugs for pre-clinical and clinical trials. The facility has been designed to produce primarily mammalian cell secreted proteins, including monoclonal antibodies and recombinant proteins. Future expansion will happen in two stages - a 'fill/finish' operation and a microbial cell facility. Being managed by a team of specialists with significant cGMP manufacturing experience in the

United States and Europe will ensure the highest standards of production and regulatory compliance. The company is headquartered in the United Kingdom.

Asian Productivity Organisation (APO)

The Asian Productivity Organisation (APO) was established on 11 May 1961 as a regional intergovernmental organisation. Its mission is to contribute to the socio-economic development of Asia and the Pacific region through enhancing productivity. The APO is nonpolitical, nonprofit and nondiscriminatory.

Badan Warisan Malaysia

Badan Warisan Malaysia has played a distinctive role in the promotion of the preservation and conservation of Malaysia's built heritage since its formation in 1983. *Badan Warisan Malaysia* is a non-governmental organisation (NGO) with charity status (i.e., tax exempted).

CAT (Competency, Accountability, Transparency)

CAT refers to the system of good governance based on competency, accountability and transparency, particularly the thorny issue of managing subsidies and national resources.

Division of Industry and Community Network (BJIM) (USM)

To foster closer, effective, meaningful and sustainable linkages and partnerships with the industry and the community (i.e., the world outside Universiti Sains Malaysia), a new division, the Division of Industry and Community Network (BJIM) was established within the Chancellery in September 2007. This new division is headed by a deputy vice chancellor (Industry and Community Network).

Development

Development refers to the act of developing and determining the best techniques for applying a new device or process to the production of goods and services.

East coast

The east coast of Malaysia is made up of Pahang, Kelantan and Terengganu. Kelantan and Terengganu can be considered very different from all the other states in Peninsular Malaysia.

Education attainment

Educational attainment is a term commonly used by statisticians to refer to the highest degree of education an individual has completed.

Economic Development

Economic development refers to increases in the standard of living of a nation's population associated with sustained growth from a simple, low-income economy to a modern, high-income economy. Its scope includes the process and policies by which a nation improves the economic, political and social well-being of its people. Economic development may also refer to the field comprising policies and efforts that seek to improve the economic well-being and quality of life for a community or region by creating and/or retaining jobs and supporting growing incomes and tax base issues.

Free Trade Zone

A Free Trade Zone (FTZ) or Export Processing Zone (EPZ) is one or more special areas of a country where some normal trade barriers such as tariffs and quotas are eliminated and bureaucratic requirements are lowered in hopes of attracting new businesses and foreign investments. It is a region where a group of countries has agreed to reduce or eliminate trade barriers. Free trade zones can be defined as labor intensive manufacturing centres that involve the import of raw materials or components and the export of factory products.

George Town

George Town is the capital of the state of Penang, Malaysia. It is located on the north–east corner of the Penang Island.

Higher Education

Higher education refers to a level of education that is provided by universities, vocational universities, community colleges, liberal arts colleges, institutes of technology and other collegiate level institutions, such as vocational schools, trade schools and career colleges, that award academic degrees or professional certifications.

Human capital

Human capital refers to the stock of skills and knowledge embodied in the ability to perform labor so as to produce economic value. It is the skills and knowledge gained by a worker through education and experience. Many early economic theories refer to it simply as labor, one of three factors of production, and consider it to be a fungible resource - homogeneous and easily interchangeable. Other conceptions of labor dispense with these assumptions.

Higher Education Action Plan 2007-2010

For execution under the 9th Malaysian Plan, the Ministry of Higher Education (MOHE) has also produced this Higher Education Action Plan to provide the appropriate focus on new initiatives as well as to highlight the key emphasis on enhancing quality in higher education. This Action Plan details critical implementation mechanisms and schedules. While some outcomes can be expected immediately, others will necessarily require gestation periods beyond three years. This is the first in a series of shorter-term action plans for each of the phases of the higher education transformation. The MOHE will conduct amid-term reviews to ensure that execution of the Action Plan remains focused and effective. This will also guide the MOHE in the formulation of the next Action Plan for the 10th Malaysian Plan.

Innovation

The term innovation means a new way of doing something. It may refer to incremental, radical and revolutionary changes in thinking, products, processes or organisations. A distinction is typically made between invention, an idea made manifested, and innovation, ideas applied successfully.

Industrial based society

An industrial based society refers to a society with a modern societal structure. Such a structure was developed in the west in the period of time following the industrial revolution. Pre-modern or Pre-industrial society are also called agrarian societies. Industrial societies are generally mass societies.

InvestPenang

InvestPenang is an entity of the state government. Its primary focus is to sustain, rejuvenate and further promote the business milieu in the state of Penang through continued investments and high technology. InvestPenang is a not-for-profit entity. It has only one path to follow – the path to success. And, one story to tell – the success story. InvestPenang has been formed with a distinct and unequivocal mission – to revive and further promote business investments in the state of Penang. In this way, it will promote Penang to be the choice of location for global enterprises.

Industrial development

The industrial revolution led to the development of factories for large-scale production, with consequent changes in society. Originally the factories were steam-powered but later transitioned to electricity once an electrical grid was developed. The mechanised assembly line was introduced to assemble parts in a repeatable fashion, with individual workers performing specific steps during the process. This led to significant increases in efficiency, lowering the cost of the end process. Later, automation was

increasingly used to replace human operators. This process has accelerated with the development of the computer and robot.

Intellectual Property (IP)

Intellectual Property (IP) refers to legal property rights over creations of the mind, both artistic and commercial, and the corresponding fields of law. Under intellectual property law, owners are granted certain exclusive rights to a variety of intangible assets such as musical, literary and artistic works; ideas, discoveries and inventions; and words, phrases, symbols and designs. Common types of intellectual property include copyrights, trademarks, patents, industrial design rights and trade secrets.

Industry Advisory Panel (IAP)

The Industry Advisory Panel (IAP) ensures that the best possible methods are being utilised to oversee the Department of State's real property assets. This group of nine, formed under the Federal Advisory Committee Act, is asked to share their knowledge and expertise on the industry and academia's latest concepts, methods, best practices and ideas related to all aspects of acquiring and building facilities as well as property management.

Intel Technology Sdn. Bhd.

The Intel Corporation has developed technology enabling the computer and internet revolution that has changed the world. Founded in 1968 to build semiconductor memory products, Intel introduced the world's first microprocessor in 1971. Today, Intel supplies the computing and communications industries with chips, boards, systems and software building blocks that are the "ingredients" of computers, servers and networking and communications products. These products are used by industry members to create advanced computing and communications systems. Intel's mission is to be the preeminent building block supplier to the internet economy.

Japan Malaysia Technical Institute (JM TI)

JM TI is an acronym for Japan Malaysia Technical Institute or Institute Teknikal Jepun Malaysia. It is under the Department of Human Energy or Jabatan Tenaga Manusia (JTM), Ministry of Human Resources and started operations in mid 1998 in a temporary campus, CIAST Shah Alam. The objective of the organisation is to manage programmes in the technology field.

Khazanah Nasional

Khazanah Nasional is the investment holding arm of the government of Malaysia and is empowered as the government's strategic investor in new industries and markets. As trustees of the nation's commercial assets, their main objective is to promote economic growth and make strategic investments on behalf of the government which would contribute towards nation building.

“Kampus Sejahtera”

Kampus Sejahtera, a uniquely Universiti Sains Malaysia innovation, was initiated by the current vice-chancellor in 2001 as the Healthy Campus Program. But, unlike the healthy campus programmes elsewhere including the United States of America, *kampus sejahtera* reaches beyond health to include ideas for sustainable development. *Sejahtera* in Malay embraces peace, harmony, tranquility, wellness and health. There is no equivalent word in the English language. As a concept, *kampus sejahtera* is meant to guide the entire Universiti Sains Malaysia community from administrators to lecturers, students and support personnel to focus their commitment and responsibility to the university.

Knowledge-based economy

The "knowledge-based economy" is an ideological weapon in the hands of the bourgeoisie. According to them, anyone who is for the "knowledge-based economy" is forward looking and progressive whilst anyone against it is part of the forces of conservatism. The conception of a "knowledge-based economy" is a justification and an illusion to cover the disastrous course of society in gearing society to pay the

rich and in globalising the economy, and is part of the arsenal of the "Third Way" illusions. But, at the same time, is it an actual economic programme which the bourgeoisie is pushing. The knowledge economy is a term that refers either to an economy of knowledge focused on the production and management of knowledge in the frame of economic constraints or to a knowledge-based economy. In the second meaning which is more frequently used, it refers to the use of knowledge technologies (such as knowledge engineering and knowledge management) to produce economic benefits.

K-economy

K-economy stands for knowledge economy. "Knowledge economy" is a vague term that refers either to an economy of knowledge focused on the production and management of knowledge in the frame of economic constraints or to a knowledge based economy. In the second meaning which is more frequently used, it refers to the use of knowledge technologies (such as knowledge engineering and knowledge management) to produce economic benefits.

Local governme

Local governments are administrative offices that are smaller than the state. The term is used to show contrast with offices at the nation-state level, which are referred to as the central government, national government or (when appropriate) federal government.

Lifelong learning

Lifelong learning, also known as "LLL" is the lifelong, life wide, voluntary and self-motivated pursuit of knowledge for either personal or professional reasons. As such, it not only enhances social inclusion, active citizenship and personal development, but also competitiveness and employability.

Multi-racial

The terms multiracial and mixed-race describe people whose ancestries come from multiple races.

Multiculturalism

The term multiculturalism generally refers to the acceptance of various cultural divisions for the sake of diversity that applies to the demographic make-up of a specific place, usually at the scale of an organisation such as a school, business, neighborhood, city or nation.

“Malaysia My Second Home” Program

The “Malaysia My Second Home” Program (commonly abbreviated "MM2H") is an international residency scheme enacted by the government of Malaysia to allow foreigners to live in the country on a long-stay visa of up to ten years. To qualify for the Program, applicants must meet certain financial and medical criteria. Successful applicants are then entitled to enter and leave the country on a largely unrestricted basis, and also benefit from other incentives aimed at making their stay in Malaysia more convenient.

Multimedia Development Corporation (MDeC)

The Multimedia Development Corporation (MDeC - previously known as MDC) is a government owned institution responsible for the management of the Multimedia Super Corridor (MSC) in Malaysia as a world-class technology industry and commerce zone.

Malaysian Biotechnology Corporation (BiotechCorp)

BiotechCorp is an agency under the purview of the Ministry of Science, Technology and Innovation and wholly-owned by the Ministry of Finance Incorporated. BiotechCorp is governed by the Biotechnology Implementation Council and advised by the Biotechnology International Advisory Panel, both chaired by the honorable Prime Minister of Malaysia. The objective of the establishment of BiotechCorp amongst others is to identify value propositions in both research and development (R&D) and commerce, and support these ventures via financial assistance and developmental services.

Malaysia External Trade Development Corporation (MATRADE)

The Malaysia External Trade Development Corporation (MATRADE) is Malaysia's national trade promotion agency. Established in March 1993, MATRADE's primary role is to assist Malaysian exporters in developing and expanding their export markets. Assisted by a network of 39 overseas offices located in major commercial cities around the world, MATRADE provides a wide range of services and assistance to both Malaysian exporters and foreign importers who are sourcing for trade related information.

Malaysian Constitution

The Federal Constitution of Malaysia is the supreme law of Malaysia. The 1957 Constitution of the Federation of Malaya is the basis of this document. It establishes Malaysia as a constitutional monarchy having the *Yang di-Pertuan Agong* as the head of state whose roles are largely ceremonial. It provides for the establishment and organisation of three main branches of the government: the bicameral legislative branch called the Parliament, which consists of the House of Representatives and the Senate; the executive branch led by the Prime Minister and consists of Cabinet Ministers; and the judicial branch headed by the Federal Court.

Majlis Perbandaraan Pulau Pinang/Municipal Council of Penang Island (MPPP)

The Municipal Council of Penang Island or Majlis Perbandaran Pulau Pinang (MPPP) is a local authority which administers the Penang Island. This agency is under the aegis of the Penang state government. MPPP is responsible for public health and sanitation, waste removal and management, town planning, environmental protection and building control, social and economic development and the general maintenance functions of urban infrastructure.

Majlis Perbandaraan Seberang Perai/Municipal Council of Seberang Perai (MPSP)

Majlis Perbandaran Seberang Perai (MPSP) or Municipal Council of Province Wellesley is a local authority which administers Seberang Perai and other areas. This agency is under the aegis of the Penang state government. MPSP is responsible for public health and sanitation, waste removal and management, town planning, environmental protection and building control, social and economic development and the general maintenance functions of urban infrastructure.

Malaysia Toray Science Foundation

The Malaysia Toray Science Foundation was established in 1993 through a RM4 million endowment by Toray Industries, Inc. Japan. The Foundation is registered with and recognised by the Malaysian authority as an organisation formed to advance the objective of promoting science and technology in Malaysia.

Nanotechnology

Nanotechnology, shortened to "**Nanotech**", is the study of the control of matter on an atomic and molecular scale. Generally, nanotechnology deals with structures of the size 100 nanometers or smaller, and involves developing materials or devices within that size. Nanotechnology is very diverse, ranging from novel extensions of conventional device physics to completely new approaches based on molecular self-assembly, to developing new materials with dimensions on the nanoscale, and even to speculation on whether we can directly control matter on the atomic scale.

9th Malaysian Plan

The 9th Malaysian Plan (Malay: Rancangan Malaysia ke-9) abbreviated as '9MP', is a comprehensive blueprint prepared by the Economic Planning Unit (EPU) of the Prime Minister's Department and the Finance Ministry of Malaysia with approval from the Cabinet of Malaysia to allocate the national budget from the year 2006 to 2010 to all economic sectors in Malaysia. The blueprint was announced on 31 March 2006, unveiled by the fifth Prime Minister of Malaysia, Datuk Seri Abdullah Ahmad Badawi in Parliament.

MARA Training Centre (Pusat Giat MARA)

GIATMARA is a non-profit education institution that provides skills training to the community. Project “GIATMARA” has successfully translated the government’s desire to eradicate poverty in rural areas, and reduce migration from rural to urban areas and social problems through job and wealth creation at grassroots level.

Ministry of Higher Education (MOHE)

The MOHE (Malay: Kementerian Pengajian Tinggi) or MOHE is a government ministry that is responsible for determining the policies and direction of higher education in Malaysia.

Malaysian Qualifications Agency (MQA)

The Malaysian Qualifications Agency or the MQA is a statutory body in Malaysia set up under the Malaysian Qualifications Act 2007 to accredit academic programmes provided by educational institutions providing post secondary or higher education and to facilitate the recognition and articulation of qualifications.

Multimedia Super Corridor (MSC)

The MSC Malaysia or formerly known as Multimedia Super Corridor is a government initiative, which is supposed to leapfrog Malaysia into the information and knowledge age. It originally included an area of approximately 15x50 km² which stretched from the Petronas Twin Towers to the Kuala Lumpur International Airport and also included the towns of Putrajaya and Cyberjaya. It expanded to include the entire Klang Valley on 7 December 2006.

Malaysian Qualifications Register (MQR)

Section 81 of the Malaysian Qualifications Agency Act 2007 (Act 679) provides that the agency shall establish and maintain a national register known as the Malaysian Qualifications Register (MQR), containing programmes, qualifications and higher education providers accredited under the act. The MQR is the reference point for accredited programmes awarded by higher education providers. These programmes or qualifications (i.e., certificate, diploma, advanced diploma, or degree) must conform to the Malaysian Qualifications Framework (MQF).

Membrane technology

Carbon Nanotubes (CNTs) are allotropes of carbon with a cylindrical nanostructure. Nanotubes have been constructed with a length-to-diameter ratio of up to 28,000,000:1, which is significantly larger than any other material. These cylindrical carbon molecules have novel properties that make them potentially useful in many applications in nanotechnology, electronics, optics and other fields of materials science, as well as potential uses in architectural fields. They exhibit extraordinary strength and unique electrical properties, and are efficient conductors of heat. Their final usage, however, may be limited by their potential toxicity.

Northern Corridor Economic Region (NCER)

Northern Corridor Economic Region (NCER) is a new economic development corridor in Malaysia. This programme is a government initiative to accelerate economic growth and elevate income levels in the north of Peninsular Malaysia - encompassing the states of Perlis, Kedah, Pulau Pinang and the north of Perak. NCER is also one of the three development regions formed in Peninsul, other development regions being the Iskandar Malaysia (formerly known as Iskandar Development Region and South Johor Economic Region) and the East Coast Economic Region (ECER) which covers the east coast states - Kelantan, Terengganu and Pahang. The NCER initiative will span from 2007 to the end of the 12th Malaysian Plan period, i.e. 2025. The NCER was launched on 30 July 2007 in Alor Setar, Kedah and on 31 July 2007 in Butterworth, Penang.

National Higher Education Fund Corporation (NHEFC)

The National Higher Education Fund Corporation (NHEFC) is a semi-autonomous body under the authority of the Ministry of Higher Education (MOHE) with the purpose of offering subsidised loans to help students meet the high tuition fees charged by newly established private higher education institutions. Eligibility for these loans was extended a few years later to students in public universities, despite the prevailing level of subsidies provided to these students. NHEFC management has been very effective in expanding the programme and in running the agency in an efficient manner.

Province Wellesley

Province Wellesley (also known as *Seberang Perai* in Malay) is a narrow hinterland of 753 square kilometres on the peninsula across a narrow channel whose smallest width is 4 km (2.5 miles). It is bordered by Kedah in the north (demarcated by the Muda River) and east, and Perak in the south and has an estimated 796,500 population.

Penang Skills Development Centre (PSDC)

This Center provides industry-relevant educational programmes and training. Hence, they play an integral role of developing talent for tomorrow's workplace.

Penang Biotech Park

Penang Biotech Park is situated at the Bukit Minyak region of Malaysia in Penang (north-western coast of Peninsular Malaysia) and is playing host to two new biotech companies. The two companies are part of a \$32m investment made by Springhill Bioventures Sdn. Bhd. for which two facilities have been constructed.

Public higher education institutions

Public higher education institutions refer to the tertiary education mandated by the government, whether national, regional or local, provided by an institution of civil government, and paid for, in whole or in part, by taxes.

Private higher education institutions

Private higher education institutions are also known as independent institutions not administered by the local, state or national government. Thus, they retain the right to select their students and are funded in whole or in part by charging their students tuition, rather than relying on public (state) funds.

Penang Development Corporation (PDC)

The Penang Development Corporation (PDC) was established under the Penang Development Corporation Enactment 1971 with the following objectives: to spearhead Penang's socio-economic development, assist in eradication of poverty by creating employment opportunities in Penang and improve the quality of life for the people of Penang.

Polytechnics

Polytechnics are tertiary education teaching institutions. Their aim is to teach both academic and vocational subjects. Their focus is applied education for work and their roots concentrate on engineering and the applied sciences, though soon after being founded, they also created departments concerned with the humanities.

Penang Cyber City (PCC)

Penang is the first state in Malaysia to be awarded the Multimedia Super Corridor (MSC) Malaysia Cybercity status. Officially known as the Penang Cybercity (PCC) it provides a hi-tech growth platform for industries and businesses. MSC Malaysia Cybercity @ Penang Cybercity-Phase 1 (PCC1) encompasses the Bayan Lepas Industrial Park and its vicinity. The second and third MSC Malaysia zones in Penang will be launched on Penang's mainland in Bertam and Batu Kawan after 2008.

Penang Educational Consultative Council (PECC)

The Social and Environmental Research Institute (SERI) serves as the secretariat for the Penang Educational Consultative Council (PECC) to assist the Penang state government in developing Penang into a centre of excellence for education. Several working committees were set up under the PECC to look into matters such as pre-school, tertiary education, non-formal and special education, arts education, Tamil schools and a new student helpline (help4u). Among the many programmes launched by these committees are the Bureau on Learning Difficulties (BOLD), Promoting Activities for Continuing Education (PACE) and the Arts Education (Arts-ED).

Penang Structure Plan 2020

This is the strategic plan for Penang's development. It highlights several proposed major infrastructure projects, including the second bridge linking the island and mainland. In Seberang Perai, the projects include the coastal road from Teluk Air Tawar in Butterworth to Kuala Muda in Kepala Batas and the expansion of the North Butterworth Container Terminal (NBCT) and Mengkuang Dam. As for Penang Island, major projects proposed are the monorail service in George Town and the Penang Outer Ring Road.

Region

Region is a geographical term that is used in various ways among the different branches of geography. In general, a region is a medium-scale area of land or water, smaller than the whole area of interest (which could be, for example, the world, a nation, a river basin, mountain range and so on) and larger than a specific site.

Regional development

Regional development is the provision of aid and other assistance to regions which are less economically developed. Regional development may be domestic or international in nature. The implications and scope of regional development may therefore vary in accordance with the definition of a region and how the region and its boundaries are perceived internally and externally.

Research Creativity and Management Office (RCMO, Universiti Sains Malaysia)

Universiti Sains Malaysia's Research Creativity and Management Office (RCMO) is a one-stop centre which handles matters pertaining to research information, grants, university facilities, equipment and human resources.

Research and Development (R&D)

It refers to "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications"

River Engineering and Urban Drainage Centre (REDAC)

The River Engineering and Urban Drainage Unit (UKSSB), a virtual research unit was established by Professor Nor Azazi Zakaria and Professor Aminuddin Ab Ghani in 1997. This unit has been active in research and consultancy works in River Basin Management (RBM) in particular, urban flooding and sediment transportation in rivers. UKSSB has received several grants from the Department of Irrigation and Drainage (DID) Malaysia and Seberang Perai Municipal Council (MPSP), Penang towards resolving urban drainage and river engineering related problems.

Research

Research is defined as human activity based on intellectual application in the investigation of matter. The primary purpose for applied research is discovering, interpreting and developing methods and systems for the advancement of human knowledge on a wide variety of scientific matters of our world and the universe. Research can use the scientific method, but need not do so.

RCE Penang @ USM

The regional centre for excellence (RCE) for Penang Island and the northern region of Malaysia aims to develop understanding on sustainable development and introduce it into educational content and practices. It also aspires to create a framework, including policies, to facilitate the introduction of sustainable development into decision making. Universiti Sains Malaysia, the leader of this RCE, works with formal education institutions, ministries of education and environment, municipal bodies and development authorities to achieve the said goals. Its primary target at the initial stage is students. The Universiti Sains Malaysia campus acts as a test ground for innovations in sustainable development that are later presented to the larger community.

Small and Medium Enterprises (SMEs)

Small to medium-sized businesses are also called SMEs (small and medium enterprises). It refers to companies that are larger than the small office/home office (SOHO), but not huge. For example, it typically refers to companies with 25 to 500 employees. However, some SMB/SME ranges use an upper limit of 5,000 employees. From an Information Technology viewpoint, the SMB/SME designation refers to the number of workstations that must be managed, rather than the number of employees in the organisation.

Software Consortium of Penang (SCoPe)

The Software Consortium of Penang or in short, SCoPe was recently set up in Penang as an initiative of the Penang state government to promote and encourage higher value-added activities in Penang. SCoPe is an alliance of Penang based software companies with diverse product and service portfolios. SCoPe is also affiliated with key institutions of the Penang state government, such as the Penang Development Corporation (PDC), Penang Skills Development Centre (PSDC), Collaborative Research and Resource Centre (CRRC) and Socio-Economic and Environmental Research Institute (SERI).

Social development

Social development is a process which results in the transformation of social structures in a manner which improves the capacity of the society to fulfill its aspirations. Society develops by consciousness and social consciousness develops by organisation. The process that is subconscious in the society emerges as conscious knowledge in pioneering individuals. Development is a process, not a programme. Its power issues more from its subtle aspects than from material objects.

Sub-region

A sub-region is a conceptual unit which derives from a larger region or continent and is usually based on location. Cardinal directions, such as south or southern, are commonly used to define a sub-region.

SMI Association of Penang

This association helps instill the small and medium industries (SMIs) and small and medium enterprises (SMEs) of the northern region of Malaysia with the desire to upgrade automate and computerize themselves in order to increase the quality of their products, improve the productivity of their factors of production and lower the costs of their businesses.

Sustainable development

Sustainable development is a pattern of resources use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also in the future.

Sustainable Penang Initiative (SPI)

The Sustainable Penang Initiative was funded by CIDA through the Canada-ASEAN Governance Innovations Network Program (CAGIN), which was coordinated by the Institute on Governance (IOG). The SPI was also supported by UNDP and UN ESCAP. The SPI aimed to establish a process for public consultation in developing and using sustainable indicators for monitoring the development of Penang.

It involved five roundtables that covered issues on ecological sustainability, social justice, economic productivity, cultural vibrancy and popular participation.

Tertiary education

Tertiary education also referred to as third stage, third level, and post-secondary education, is the educational level following the completion of a school providing a secondary education, such as high school and secondary school. Higher education is normally taken to include undergraduate and postgraduate education, while vocational education and training beyond secondary education is known as further education in the United Kingdom, or higher education in the United States.

The Ministry of International Trade and Industry (MITI)

The Ministry of Commerce and Industry was established in April 1956 and situated at the Government Office, Jalan Raja. The Ministry was then renamed the Ministry of Trade and Industry in February 1972. On 27 October 1990, the Ministry was separated into two ministries which are: Ministry of International Trade and Industry (MITI); and Ministry of Domestic Trade and Consumer Affairs (KPDN).

The Malaysian Industrial Development Authority (MIDA)

The Malaysian Industrial Development Authority (MIDA) sometimes referred to as the "Federal Industrial Development Authority" or "FIDA" is an agency of the Malaysian government set up to advise the federal and state government on industrial development policies, advise local and foreign enterprises on the Malaysian industry, manage business licensing and exemptions from tariffs or import duties, and co-ordinate industrial development.

The Penang Heritage Trust (PHT)

The Penang Heritage Trust is a registered tax-exempt, non-governmental organisation (NGO) based in Penang. PHT's objective is to promote the conservation of Penang's heritage and to foster cultural education about the history and heritage of Penang.

The Penang Environment Working Group (PEWOG)

The Penang Environment Working Group (PEWOG) is a consultative, planning and coordinating environmental body set up by the State Local Government Committee of Penang, Malaysia.

USAINS Holding Sdn. Bhd.

The USAINS Group as the commercial arm of Universiti Sains Malaysia is responsible for managing all its commercial activities. USAINS markets and promotes the intellectual property of the university - such as its innovative products, processes, patents, designs, copyright material and the consultancy services of its highly qualified professional and technical staff. USAINS also markets the University's physical and highly sophisticated technological facilities. The mode of commercialisation takes the form of contract research, consultancy and testing services, project management, clinical practices, joint ventures, licenses and sale of intellectual property.

University colleges

The term "university college" is used in a number of countries to denote institutions that provide tertiary education but do not have full or independent university status. A university college is often part of a larger university.

United Nation University's Regional Centre for Excellence (UNU-RCE)

A regional centre for excellence (RCE) is a network of existing formal, non-formal and informal education organisations, mobilised to deliver education for sustainable development (ESD) to local and regional communities. A network of RCEs worldwide will constitute the Global Learning Space for Sustainable Development. RCEs aspire to achieve the goals of the United Nation Decade of Education

for Sustainable Development (DESD, 2005-2014), by translating its global objectives into the context of the local communities in which they operate.

Unit Perancang Ekonomi Negeri Pulau Pinang (UPEN)/ Penang State Economic Planning Unit

UPEN studies, determines, analyses and constructs state development policies and programmes/activities.

United Nations Educational Scientific and Cultural Organisation (UNESCO)

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) was established on 16 November 1945. This organisations purpose is to contribute to peace and security by promoting international collaboration through education, science and culture in order to further universal respect for justice, the rule of law, human rights and fundamental freedom proclaimed in the United Nation's Charter.

Warga Emas

Warga Emas refers to elderly citizens aged 55 years and above.

Warga OKU

Warga OKU refers to citizens who are disabled.

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ANNEX A
LIST OF INTERNATIONAL PATENTS FILED (AS AT APRIL 2010)
BY UNIVERSITI SAINS MALAYSIA

NO.	PATENTS	SCHOOLS	RESEARCHERS	PATENTED COUNTRY	FILING DATE	STATUS
1	DNA Sequence Encoding The Specific And Antigenic Outer Membrane Protein Of Salmonella Typhi	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Ong Kok Hai, Zainoodin Sheik Abdul Kader, Manickam Ravichandran	Brazil	28-02-2000	Awaiting for Cleared Examination Report.
2	DNA Sequence Encoding The Specific And Antigenic Outer Membrane Protein Of Salmonella Typhi	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Ong Kok Hai, Zainoodin Sheik Abdul Kader, Manickam Ravichandran	UAE	28-02-2000	Pending
3	Vibrio Cholerae Strains VCUSM 1 And VCUSM 4 Method Of Producing Same And Vaccine Derivatives Thereof	School of Medical Sciences	Manickam Ravichandran	USA	24-05-2007	Pending Examination
4	An Assay For Allergenic Proteins Of Natural Rubber Latex	School of Pharmaceutical Sciences	Mary Jane Cardosa	Thailand	01-05-1995	Pending Examination
5	A New Physical Form of Artemisin And Its Use In the Production of Pharmaceuticals	School of Pharmaceutical Sciences	Chan Kit Lam	Thailand	29-10-1997	Pending Examination
6	Filarial Parasite Polypeptides and Sequences, Gene Sequences and Uses Thereof"	Institute for Research in Molecular Medicine (INFORMM)	Rahmah Noordin, Khairul Anuar Abdullah	India	24-10-2000	Pending Examination
7	DNA Sequence Encoding The Specific And Antigenic Outer Membrane Protein of Salmonella Typhi	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Ong Kok Hai, Zainoodin Sheik Abdul Kader, Manickam Ravichandran	Thailand	29-01-2001	Pending Examination
8	DNA Sequence Encoding The Specific And Antigenic Outer Membrane Protein of Salmonella Typhi	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Ong Kok Hai, Zainoodin Sheik Abdul Kader, Manickam Ravichandran	Nepal	27-02-2001	Pending Examination
9	Polar Organic Extract Of Eurycoma Longifolia	School of Pharmaceutical Sciences	Chan Kit Lam, Low Bin Seng, David Ho Sue San	USA	28-11-2008	Pending Examination
10	Polar Organic Extract Of Eurycoma Longifolia	School of Pharmaceutical Sciences	Chan Kit Lam, Low Bin Seng, David Ho Sue San	Korea	21-10-2008	Pending Examination
11	Polar Organic Extract Of Eurycoma Longifolia	School of Pharmaceutical Sciences	Chan Kit Lam, Low Bin Seng, David Ho Sue San	Indonesia	22-10-2008	Pending Examination
12	Polar Organic Extract Of Eurycoma Longifolia	School of Pharmaceutical Sciences	Chan Kit Lam, Low Bin Seng, David Ho Sue San	Japan	01-02-2009	Pending Examination
13	Method For Rapid Detection of Lymphatic Filariasis	Institute for Research in Molecular Medicine (INFORMM)	Rahmah Noordin	Sri Lanka	16-10-2008	Pending Examination
14	Method For Rapid Detection of Lymphatic Filariasis	Institute for Research in Molecular Medicine (INFORMM)	Rahmah Noordin	India	20-10-2008	Requested Substantive Examination. Awaiting Office Action.
15	Method For Rapid Detection of Lymphatic Filariasis	Institute for Research in Molecular Medicine (INFORMM)	Rahmah Noordin	Vietnam	15-10-2008	Pending Examination
16	Method For Rapid Detection of Lymphatic Filariasis	Institute for Research in Molecular Medicine (INFORMM)	Rahmah Noordin	Philippines	15-10-2008	Pending Examination

NO.	PATENTS	SCHOOLS	RESEARCHERS	PATENTED COUNTRY	FILING DATE	STATUS
17	Method For Rapid Detection of Lymphatic Filariasis	Institute for Research in Molecular Medicine (INFORMM)	Rahmah Noordin	USA	16-10-2008	Notice of Acceptance
18	The Formulation Of Coating Polymer For Electroless Metal Plating	School of Chemical Sciences	Mohamad Nasir Bin Mohamad Ibrahim , Coswald Stephen Sipaut @ Mohd Nasri	PCT	30-04-2008	Pending Examination
19	A Process For Producing Carbon Nanotubes (CNTs)	School of Chemical Engineering	Abdul Rahman Mohamed, Chai Siang Piao	PCT	18-11-2008	Pending Examination
20	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	PCT	18-12-2008	Pending Examination
21	A Solid State Fermentation (SSF) System	School of Biological Sciences	Darah Ibrahim, Lee Chee Keong, Pang Pei Kheng, Ibrahim Che Omar	PCT	17-02-2009	Pending Examination
22	Recombinant Antigen For Detection of Toxocariasis	Institute for Research in Molecular Medicine (INFORMM)	Rahmah Noordin, Suharni Binti Mohamed	PCT	27-02-2009	Pending Examination
23	Throttle and Brake Lock (Throttle Lock)	School of Mechanical Engineering	Mohd Salman Abu Mansor, Ahmad Yusoff Bin Hassan, Bok Aun Yong, Khairul Radzi Bin Aliasak, Abu Bakar Bin Baharum	PCT	23-12-2009	Pending
24	A Real Time Distributed Network Monitoring and Security Monitoring Platform (RTDNMS)	National Advanced IPv6 Centre (NAv6)	Sureswaran Ramadass, Ahmed Mansour Manasrah	PCT	31-12-2009	Pending
25	Apparatus And Method For Sensing And Measuring A Displacement Of A Crack	School of Mechanical Engineering	Mani Maran a/l Ratnam, Chan Hooi Mei , Yen Kin Sam	PCT	14-10-2009	Pending
26	Extraction and Purification of Polyester Granules	School of Biological Sciences	K. Sudesh Kumar A/L C. Kanapathi Pillai	PCT	03-05-2009	Pending
27	Gene Encoding Polymer Synthase And A Process For Producing Polymer	School of Biological Sciences	K. Sudesh Kumar A/L C. Kanapathi Pillai, Mohammed Razip Bin Samian, Amirul Al-Ashraf Balakrishnan Bin Abdullah , Kesaven A/L Bhubalan	PCT	To Check	Pending
28	A Process for Bioenzymatic Deinking of Paper	School of Biological Sciences	Darah Ibrahim, Lee Chee Keong, Pang Pei Kheng, Ibrahim Che Omar	PCT	11-02-2009	Pending Examination
29	A Passive RFID Reader System	School of Electric & Electronic Engineering	Widad Ismail, Kamal Zuhairi Zamli, Nor Ashidi Mat Isa, Zaini Abdul Halim, Mandeep Singh Jit Singh	PCT	22-01-2010	Pending
30	A System for Producing L-Homophenylalanine and A Process for Producing L-Homophenylalanine	School of Chemical Engineering	Abdul Latif Ahmad , Oh Pei Ching, Syamsul Rizal Abd Shukur	PCT	05-01-2010	Pending
21	A Solid State Fermentation (SSF) System	School of Biological Sciences	Darah Ibrahim, Lee Chee Keong, Pang Pei Kheng, Ibrahim Che Omar	PCT	17-02-2009	Pending Examination
22	Recombinant Antigen For Detection of Toxocariasis	Institute for Research in Molecular Medicine (INFORMM)	Rahmah Noordin, Suharni Binti Mohamed	PCT	27-02-2009	Pending Examination
23	Throttle and Brake Lock (Throttle Lock)	School of Mechanical Engineering	Mohd Salman Abu Mansor, Ahmad Yusoff Bin Hassan, Bok Aun Yong, Khairul Radzi Bin Aliasak, Abu Bakar Bin Baharum	PCT	23-12-2009	Pending

NO.	PATENTS	SCHOOLS	RESEARCHERS	PATENTED COUNTRY	FILING DATE	STATUS
24	A Real Time Distributed Network Monitoring and Security Monitoring Platform (RTDNMS)	National Advanced IPv6 Centre (NAv6)	Sureswaran Ramadass, Ahmed Mansour Manasrah	PCT	31-12-2009	Pending
25	Apparatus And Method For Sensing And Measuring A Displacement Of A Crack	School of Mechanical Engineering	Mani Maran a/I Ratnam, Chan Hooi Mei , Yen Kin Sam	PCT	14-10-2009	Pending
26	Extraction and Purification of Polyester Granules	School of Biological Sciences	K. Sudesh Kumar A/L C. Kanapathi Pillai	PCT	03-05-2009	Pending
27	Gene Encoding Polymer Synthase And A Process For Producing Polymer	School of Biological Sciences	K. Sudesh Kumar A/L C. Kanapathi Pillai, Mohammed Razip Bin Samian, Amirul Al-Ashraf Balakrishnan Bin Abdullah , Kesaven A/L Bhubalan	PCT	To Check	Pending
28	A Process for Bioenzymatic Deinking of Paper	School of Biological Sciences	Darah Ibrahim, Lee Chee Keong, Pang Pei Kheng, Ibrahim Che Omar	PCT	11-02-2009	Pending Examination
29	A Passive RFID Reader System	School of Electric & Electronic Engineering	Widad Ismail, Kamal Zuhairi Zamli, Nor Ashidi Mat Isa, Zaini Abdul Halim, Mandeep Singh Jit Singh	PCT	22-01-2010	Pending
30	A System for Producing L-Homophenylalanine and A Process for Producing L-Homophenylalanine	School of Chemical Engineering	Abdul Latif Ahmad , Oh Pei Ching, Syamsul Rizal Abd Shukor	PCT	05-01-2010	Pending
31	Air Pollution Measuring and Warning System	School of Physics	Wong Chow Jeng, Mohd Zubir Mat Jafri, Khiruddin Abdullah, Lim Hwee San	PCT	07-05-2010	Pending
32	W-Bronze Metal Matrix Composites Produces By A Three-In-One Densification Process	School of Material & Mineral Resource Engineering	Kahtan S. Mohammed, Azmi Bin Rahmat, Azizan Bin Aziz	PCT	To Check	Pending
33	Dot Enzyme Immunoassay (dot EIA) For Rapid Serodiagnosis of Melioidosis	Advanced Medical and Dental Institute (AMDI) (In Collaboration with INFORMM)	Zainoodin Sheik Abdul Kader, Asma Ismail, Subramania Aiyar	PCT	To Check	Pending
34	A Method For Preparing A Gelling And Viscosifying Agent For Drilling Mud And The Product Thereof	School of Chemical Sciences	Mohamad Nasir Bin Mohamad Ibrahim , Mohamed Rashid Ahmed Mohamed, Coswald Stephen Sipaut @ Mohd Nasri	PCT	21-10-2009	Pending
35	A Method To Differentiate Gelatin Capsule Of Porcine Source From The Bovine Source	School of Pharmaceutical Sciences	Gam Lay Harn, Siti Zuraidah Binti Mohamad Zobir, Yap Beow Keat	PCT	15-04-2010	Pending
36	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	Thailand	23-07-2009	Pending
37	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	USA	27-07-2009	Pending
38	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	Singapore	24-07-2009	Pending
39	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	India	24-07-2009	Pending
40	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	Taiwan	27-07-2009	Pending

NO.	PATENTS	SCHOOLS	RESEARCHERS	PATENTED COUNTRY	FILING DATE	STATUS
41	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	Korea	29-07-2009	Pending
42	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	Japan	28-07-2009	Pending
43	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	Indonesia	28-07-2009	Pending
44	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	German	29-07-2009	Pending
45	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	China	29-07-2009	Pending
46	A Disposable Multiplex Polymerase Chain Reaction (PCR) Chip and Device	Institute for Research in Molecular Medicine (INFORMM)	Asma Ismail, Sugumar Dharmalingam , Kong Lingxue	Australia	27-07-2009	Pending
47	A Method for Pretreating Crude Oil Using Microorganism	School of Biological Sciences	Ahmad Ramli bin Mohd Yahya, Mohamad Nasir Bin Mohamad Ibrahim , Nur Asshifa binti Md Noh	PCT	31-03-2010	Pending
48	Ceramic Composition, Low Voltage Zinc Oxide Varistor Made From The Ceramic Composition And Process For Manufacturing The Low Voltage Zinc Oxide Varistor	School of Physics	Shahrom Mahmud	PCT	12-04-2010	Pending
49	Toothbrush With Bristles In An Isosceles Configuration	Advanced Medical and Dental Institute (AMDI)	Robina Shaheen, Ashfaq Akram, Choudhary Ibrar Ahmed, Abdel Hamid Zaki Abdel Hamid, Tang Thean Hock	PCT	30-03-2010	Pending

Source: RCMO, Universiti Sains Malaysia (2010)

ANNEX B

Summary of the Acts under the jurisdiction of the Ministry of Higher Education and Penang Educational Consultative Council (PECC)

1) Private Higher Educational Institutions Act 1996 (Act 555)

An Act to provide for the establishment, registration, management and regulation, and the quality control of education offered by the private institutions of higher learning.

2) Universities and University Colleges Act 1971 (Act 3)

An Act to provide for the establishment, organisation and management of Universities and Public University Colleges and for matters connected herewith.

3) National Council on Higher Education Act 1996 (Act 546)

An Act to establish the National Council on Higher Education and to provide for its function relating to higher education and for matters connected herewith. Among the functions of the National Council on Higher Education are:

- to plan, formulate and determine national policies and strategies for the development of higher education;
- to co-ordinate the development of higher education;
- to promote and facilitate the orderly growth of institutions of higher education;
- to determine policies and set criteria for the allocation of funds to higher educational institutions;
- to determine policies relating to the entry of students to higher educational institutions;
- to determine policies and set guidelines on matters pertaining to the salary structure and personnel management system of Universities and University Colleges established under the Universities and University Colleges Act 1971;
- to determine policies and set guidelines on fee structure;
- to determine policies and set guidelines on the areas or courses of study to be undertaken by higher educational institutions;
- to determine policies and set guidelines on the conduct of any course of study or training programme by higher educational institutions jointly, or in association, affiliation, collaboration or otherwise, with any University or institution of higher educational or other educational institution or organisation within or outside Malaysia;
- to determine policies and set guidelines on the involvement in business activities by Universities in accordance with the powers conferred under the Universities and University Colleges Acts;
- to take such actions or do such things as it deems fit or necessary to carry out its functions powers effectively.

4) National Accreditation Act 1996 (Act 556)

An Act to establish the National Accreditation Board and to provide for its functions and power and for matters connected herewith. Among the functions of the Accreditation Board are:

- to formulate policies on the standard and quality control of:-
 - (i) courses of study; and
 - (ii) certificates, diplomas and degrees
- to set, monitor, review and oversee the standard and quality:
 - (i) courses of study; and
 - (ii) for accreditation of certificates, diplomas and degrees;
- to determine the level of achievement for the national language and the compulsory subjects specified in the Private Higher Educational Institutions Act 1996 as prerequisites to the award of certificates, diplomas and degrees; and
- to advise and make recommendations to the Minister for his approval of courses of study to be conducted by private higher educational institutions with regard to: - (i)the suitability of arrangements relating to the educational facilities relevant to the courses of study; and the standard and quality assurance of the courses of study.

5) National Higher Education Fund Board Act, 1997 (Act 566)

An Act for the establishment of the National Higher Education Fund and the formation of the National Higher Education Fund Board. Among the functions of the National Higher Education Board are:

- to establish and provide educational loans and financial assistance apart from educational loans to students, and to establish administration, supervision and collection of loan repayment services;
- to collect deposits and design and provide saving schemes for the purpose of savings for higher education; and to carry out any other functions given to corporations by any written laws.

6) Tunku Abdul Rahman Foundation Act

An Act for the establishment of the Tunku Abdul Rahman Foundation and to provide for the management of this foundation and for matters connected herewith.

7) Universiti Teknologi MARA Act 1976 (Act 173)

An Act for the establishment, organisation and management of Universiti Teknologi MARA and for matters related to it.

8) Politeknik Ungku Omar Act 1974 (Act 145)

An Act for the establishment

9) Educational Institutions (Discipline) Act 1976 (Act 174)

An Act regarding the methods of discipline for students of UiTM, polytechnics and community colleges.

10) Education Act 1996 (Act 550)

There are provisions in this Act for the Ministry of Higher Education regarding the establishment and management of polytechnics and community colleges.

The formal education comes under the jurisdiction and is the responsibility of the Federal Government; however, the State Government has been and will continue to play its part in supplementing the formal system and enhancing educational opportunities at various levels through the following mechanism:

Penang Educational Consultative Council (PECC)

Penang Educational Consultative Council (PECC) was established in 1997 under the Penang State Government Executive Council for Education. PECC was set up to facilitate input from educationists on how to assist the State Government in developing Penang into a prominent centre for education. Although education is largely under the jurisdiction of the Federal Government, the State Government can play an important complementary role to enhance the educational environment in the state. PECC's general objectives are:

- Periodical monitoring and reviewing the state and quality of education in Penang;
- Providing a forum for deliberations on a wide range of matters pertaining to the future of education in Penang;
- Conveying to the State Government considered opinions on a variety of educational issues which can form the basis for educational strategy formulation and implementation;
- Identifying educational areas needing State Government intervention;
- Setting guidelines for the development of educational institutions, programmes and projects; and
- Recommending specific action programmes and projects to be implemented by the State Government in the field of education.

The Council is responsible for facilitating continuous quality improvement in cultivation of skills, mental, moral and aesthetic developments as well as informal education. The sub-committees under the Council are responsible to coordinate the delivery of educational programmes and reaches out to all walks of life in adherence to the motto "*Education for All*". This is accomplished by developing innovative programmes and encouraging as well as facilitating close working relationship with all the parties involved.

Since 1997, Council members had been appointed by Penang State Government. In each term, Council members serve for two years and they can be reappointed when their term is due. The current Council members consist of prominent educationists in Penang, head of faculties, representatives from relevant government agencies and distinguished individuals who are interested in educational development in the State of Penang who serve on voluntary basis.

Socio-Economic & Environmental Research Institute (SERI) has been appointed as the secretariat for the PECC. Under the umbrella of PECC, there are six working committees that specialize in various aspects/levels of education, except primary and secondary education that are under the jurisdiction of federal government. The six working committees are Bureau of Learning Difficulties, Preschool Education, Tertiary, and Promoting Activities for Continuing Education, Helpline for Students and Arts-Education.

Other than PECC, the Penang State Government had also initiated in the year 1999 with the cooperation of SERI a programmer to cultivating interest in science and mathematics through awareness and enrichment programmes especially for students in schools that are not well endowed, as well as through exhibitions and competitions known as Science and Technology Awareness Programme (also

known as PPST). The programme is implemented in collaboration with various government sectors, non-governmental organisation, local government bodies and authorities as well as draw expertise from tertiary institution especially Universiti Sains Malaysia to assist in implemented various programmes.

ANNEX C

List of Public and Private Higher Education Institutions in Penang Region

Table 1 List of Private Higher Education Institutions in Penang Region

No	Institutions	No	Institutions
1	Akademy of Kreatif Wisma Kreatif, 50 Jalan Pahang, 10400 George Town, Pulau Pinang	8	Institute of Butterworth Technology No.4476/77/78, Tingkat 2 & 3, Sime Bank Building, Jalan Bagan Luar, P.O. Box 13, Butterworth, Pulau Pinang
2	Allianze College of Medical Sciences No 55, Jalan Seri serdang 3,Taman Seri Serdang, Kepala Batas 13200 Pulau Pinang	9	KDU College, Penang Campus 32, Jalan Anson, 10400 Pulau Pinang
3	Equator Academy of Art 8A, Lorong Amoy, 10050 Pulau Pinang	10	Excelpolitan International College Wisma XPI, Tingkat 3, Jalan Bukit Dumbar, 11600 Pulau Pinang.
4	Institute of First Robotics Industrial Science (M) 12.09 & 12.04, West Side Level 2, Main Area Pisa, Jalan Tun Dr Awang, Relau , 11900 Pulau Pinang	11	College ATC Tingkat 18-20, Menara UMNO, Lot 128, Jalan Macalister, 10400 Pulau Pinang.
5	Institute Teknologi & Pengurusan Leboh Victoria 245, Tingkat 2 & 3, Leboh Victoria, George Town, 10300 Pulau Pinang	12	College Disted-Stamford Kampus Yeap Chor Ee No 340, Jalan Macalister, 10350 Pulau Pinang
6	Institute Teknologi Sentral 49, Jalan Sultan Zainal Abidin, 10400 Pulau Pinang	13	College Excel (TL Management Centre) 30 & 32, Tingkat 2, Bangunan MNI, Leboh Bishop, 10200 Pulau Pinang.
7	Institute of Silicon Technology 2790 Ground, 1st & Top Floor, Jalan Chain Ferry, Taman Inderawasi, 13600 Prai, Pulau Pinang	14	College Han Chiang Jalan Lim Lean Teng, 11600 Air Hitam, George Town, Pulau Pinang.
15	College I-Systems Bukit Mertajam G45, The Summit, Bukit Mertajam Plaza, 14000 Pulau Pinang	24	Penang Medical College No 4, Jalan Sepoy Lines, 10450 Pulau Pinang

16	College of International Technology of Islam (KITAB) Bangunan Tahfiz, Kompleks Masjid Negeri Pulau Pinang, Jalan Air Hitam, 11400 George Town, Pulau Pinang	25	Penang International Dental College Tingkat 19-21 NB Tower, No. 5050, Jalan Bagan Luar, 12000 Butterworth, Pulau Pinang
17	Adventist Nursing College 465 Jalan Burma, 10350 Pulau Pinang	26	Kolej PTPL Penang (Institut Perkim – Goon) 239, Jalan Burmah, 10350 Pulau Pinang.
18	Nursing College 141, Jalan Tan Sri The Ewe Lim, 11600 Pulau Pinang	27	College of Reliance Penang Branch 28A-2, Tingkat 2, Lorong Abu Siti, 10400 Pulau Pinang
19	Olympia College Tingkat 28,29 & 30, Northam Tower, No. 57, Jalan Sultan Ahmad Shah,10050 Pulau Pinang	28	Kolej Surya Tingkat 17-18, NB Tower, No 5050, Jalan Bagan Luar, 12000 Butterworth, Pulau Pinang
20	Penang International INTI College 1-Z, Lebuah Bukit Jambul, 11900 Pulau Pinang	29	Penang Segi College 43, Green Hall , 10300 Pulau Pinang
21	Penang Skills and Development centre (PSDC) No 1,Jalan Sultan Azlan Shah, Bandar Bayan Baru, 11900 Bayan Lepas, Pulau Pinang.	30	International Technology Cosmopoint college, Penang Branch No 236, Jalan Dr. Lim Chwee Fong, 10100 Pulau Pinang
22	Open University Malaysia Pulau Pinang Learning Centre 1 Lebuah Tenggiri 2, Pusat Bandar Seberang Jaya 13600 Pulau Pinang	31	Island College of Technology Bangunan Kraftangan, Sungai Rasa, 11000 Balik Pulau, Pulau Pinang
23	Wawasan Open University (WOU) 51-20, Menara BHL Jln Sultan Ahmad Shah 10050 PULAU PINANG		

Source: MOHE & SERI (2009)

Table 2 List of Public Institutions (University, Polytechnic and Community Colleges as well as training centers in Penang Region.

No	Name and Address of Institutions	No	Name and Address of Institutions
1	Universiti Sains Malaysia	13	Centre of Giatmara Pongsu Seribu
2	Universiti Sains Malaysia (Engineering Campus)	14	National Institute of Youth Training Bukit Mertajam
3	Universiti Teknologi MARA (Penang Branch)	15	Institute of arms Technology and explosive (TUDM)
4	Industry Training Institute of Kepala Batas	16	Politeknik of Seberang Perai
5	Industry Training Institute of Arumugam Pillai, Nibong Tebal	17	Community College of Bayan Baru
6	Jepun Malaysia Technical Malaysia (JMTM)	18	Community College of Kepala Batas
7	MARA Training Center of Balik Pulau	19	Training Centre of KEMAS Kepala Batas
8	Centre of Giatmara Bayan Lepas	20	Centre of Giatmara Nibong Tebal
9	Centre of Giatmara Bagan	21	Centre of Giatmara Permatang Pauh
10	Centre of Giatmara Machang Bubok	22	College of Tunku Abdul Rahman
11	Centre of Giatmara Police Sungai Bakap	23	Politechnic of Balik Pulau
12	Centre of Giatmara Kepala Batas		

Source: MOHE & SERI (2009)

ANNEX D

Summary of Transforming Higher Education for a Sustainable Tomorrow by Dzul kifli Abdul Razak and Ramli Mohamed, Universiti Sains Malaysia

The Ministry of Higher Education (MOHE) has requested all local institutions of higher learning to submit their proposal for consideration to be selected as an APEX university. The Accelerated Programme for Excellence (APEX) is a fast track development programme for institutions of higher education to achieve and to be recognised as world-class institutions. Universiti Sains Malaysia believes that it should be considered and selected to be an APEX university for several reasons. Since its establishment in June 1969, Universiti Sains Malaysia has registered such remarkable accomplishments in teaching and learning as well as research and innovation activities as to merit the institution with such a status. Furthermore, the university is in the best position to attain world-class status as it has built the basic infrastructure to become more competitive at the global level as well as being able to attract quality staff and students locally and from abroad. In 2007, the university was anointed as one of four research universities by MoHE through a rigorous evaluation process elevating its status to the top of more than 100 public and private universities and colleges in Malaysia. In the same year too, Universiti Sains Malaysia was rated as the only “excellent” (or 5-Star) university in the Academic Reputation Survey conducted by the Malaysian Qualification Agency (MQA).

Universiti Sains Malaysia believes that it can play a role and contribute to sustainable development vis-à-vis the generation of human capital, acting as a source of expertise through research and consultancy, by bringing together talents and elements for sustainability, adopting best practices through on-campus management and development activities to undertake strategic planning, building design, waste control and water and energy efficiency practices. In a similar vein, the university will also be prudent in its acquisition programmes and pursue good citizen-type initiatives like a “green campus” concept as well as offering recognition and reward incentives for staff to be involved in sustainable development leadership in the regional community.

The starting point is to integrate sustainable development into the educational system so that future generations can be nurtured and imbued with the need to embrace ecological protection, conservation of resources and human development based on the virtues of equity, accessibility, availability, affordability and quality. Following the compelling practices adopted by the European universities, Universiti Sains Malaysia is strategizing itself to be more autonomous, accountable, and will provide incentives for partnership and business, the right mix of skills for the labour market and the community. The university will aim at reducing the funding gap and make funding work more effectively as well as enhance interdisciplinary and transdisciplinary learning and knowledge accumulation, facilitate interaction of knowledge and society and reward and recognise excellence.

The starting point is to integrate sustainable development into the educational system so that future generations can be nurtured and imbued with the need to embrace ecological protection, conservation of resources and human development based on the virtues of equity, accessibility, availability, affordability and quality. Following the compelling practices adopted by the European universities, Universiti Sains Malaysia is strategising itself to be more autonomous, accountable, and will provide incentives for partnership and business, the right mix of skills for the labour market and the community. The university will aim at reducing the funding gap and make funding work more effectively as well as enhance interdisciplinary and transdisciplinary learning and knowledge accumulation, facilitate interaction of knowledge and society and reward and recognise excellence. Another strategy which Universiti Sains Malaysia will follow to realise this sustainability-led growth is the “Blue Ocean Strategy” which is proposed by Kim and Mauborgne (2005) as entities to propel itself toward unknown market space (hence the blue ocean) which is untainted by competition. “Blue ocean” is analogised as the deeper potential of market space that is yet to be explored and this requires institutions to expand their existing boundaries and change the rules of the game which, in turn, will

render competition irrelevant. By choosing sustainability-led growth as its destination, Universiti Sains Malaysia will embark on numerous transformational journeys, including revamping most of its activities pertaining to nurturing and learning, research and innovation, services, students and alumni and the management of the university as a whole. The university will take steps to improve the three core pillars of its strengths, i.e., concentration of talent, resources and acculturation of supportive governance.

In the area of nurturing and learning, the university will enhance student-centered and sustainable development curricula, market relevance, technology learning, skills competency and linkage between research and learning. The university will also re-examine its entry requirements to include non-traditional entry modes, democratize knowledge education through the use of Open Course Ware (OCW) and accelerate open learning. For research and innovation, efforts will be made to increase the presence of foreign students and staff, including towering personalities who can lend support to navigate USM's research towards the blue ocean. In line with the theme of sustainable development and being a sustainability-led university, more research programmes will be realigned in the areas of health biotechnology and molecular medicine, fundamental research, biodiversity and environment and engineering research. To help support the intensification of research during the APEX university period, Universiti Sains Malaysia will use its latest endeavor, that is, the establishment of Science and Arts Innovation Space (SAINS @ USM) that combines the talents of USM's faculty members from all centers and schools to create an environmentally friendly innovation space.

The transformation plan also includes the revamping of other activities and programmes of the university including postgraduate studies, students' and self-development services, and alumni initiatives. By the same token, many changes will be made to other elements of the university, such as the concentration of talent, resources and supportive governance to act as catalyst for the accomplishment of the transformation of nurturing and learning, research and innovation and services. Eventually, the key performance indicators (KPIs) for Universiti Sains Malaysia in this APEX programme will be articulated and manifested in the sustainability relevant issues for those at the bottom of the pyramid, in particular.

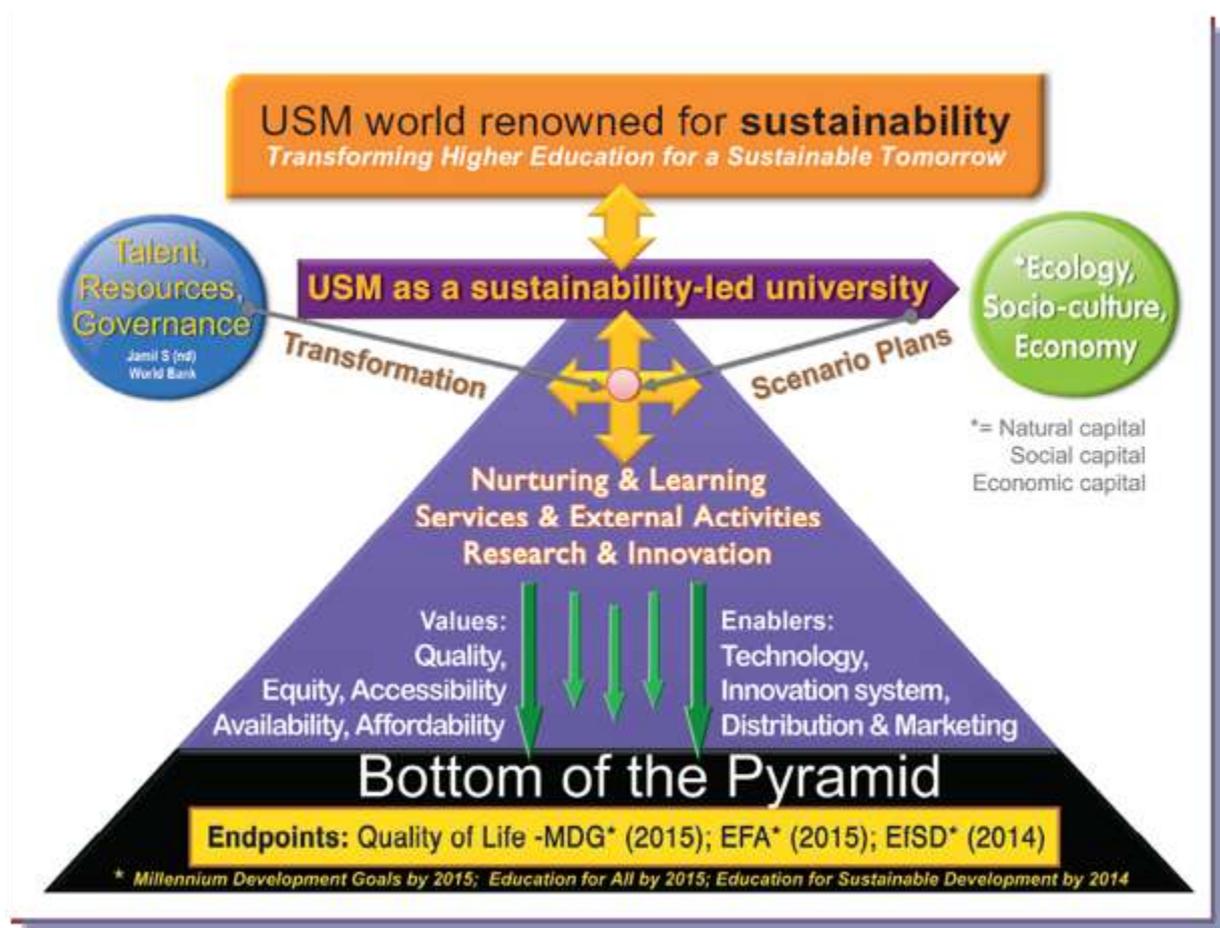


Figure 6. Universiti Sains Malaysia APEX University Framework.

Source: Abdul Razak and Mohamed (2008)

As a university, Universiti Sains Malaysia follows a two-tiered approach. First, the university aspires to be world renowned for sustainability. Second, it also aims to be a sustainability-led university. Please see the figure above.

With regard to the first tier, since 2000 Universiti Sains Malaysia has embarked on a series of initiatives to become socially responsible as it develops. It has embraced ecological protection, the conservation of resources and human development and the accepted framework for achieving sustainability on campus. This will provide the platform as the university moves forward in the years to come. To realise this aspiration, the university has taken initial steps to refocus and retool its teaching and research programmes and activities toward the need to live within the environmental limits.

Those initial steps taken to excel in the issues of sustainability will now be accelerated under the APEX programme. Throughout the programme period, Universiti Sains Malaysia will be more assertive in moving toward sustainability by reinvigorating and transforming its teaching and learning programmes, R&D activities and services to produce quality outcomes which are equitable, accessible, available and affordable. The ultimate aim is to support the drive to improve the wellbeing of humanity, the marginalised bottom of the pyramid in particular (Pralhad, 2006)¹³. Eventually our efforts would also contribute toward the attainment of global visions as endorsed by world leaders including Malaysia, such as the Millennium Development Goal (MDGs) 14 by 2015, and Education for Sustainable Development (ESD) by 2014¹⁵.

For the second tier, i.e., transforming Universiti Sains Malaysia to be a sustainability-led university, the effort started in early 2001 will be rigorously pursued and expanded in order to ensure the campus produces human capital as the seeds of social transformation that is sustainable from amongst staff and students. This endeavour is proposed on the understanding that education is the key to change unsustainable lifestyle and mindset. Students and staff must be provided with learning tools and opportunities in the real world environment to integrate knowledge and concepts of sustainability to local practices, applications and solutions. In turn, outreach programmes by the university will introduce sustainability to the local and global community.

This strategy is congruent to the transformational role played by Universiti Sains Malaysia as the UNU-RCE on Education for Sustainable Development (RCE Penang @ USM) since 2005. An RCE is a network of existing formal, non-formal and informal education organisations aiming to deliver education for sustainable development (ESD) to a regional/local community. All RCEs have a common framework aspiring to achieve the goals of the UN Decade of Education for Sustainable Development (DESD, 2005-2014), by translating the global agenda such as the Millennium Development Goals, Climate Change and Education for All into the context of the local/regional/global community in which they operate. RCE Penang @ USM, of which the university plays the leading and Secretariat role, is one of the pioneer groups of seven RCEs (Pilot RCEs) to receive recognition by UNESCO/UNU in June 2005 for its work on education for Sustainable development.

There are currently some 52 RCEs around the world and the number is expected to reach 200 by the end of the Decade of Education for Sustainable Development. Hence Universiti Sains Malaysia can establish itself as a recognised leader. RCE Penang @ USM has brought together a wide range of NGOs, organisations and individuals which are actively involved in SD related activities in local, regional and international levels. RCE Penang @ USM has organised various activities ranging from publications, workshops, consultations and seminars on various themes of sustainability such as re-orienting teachers' education to address sustainability. RCE Penang@ USM has also hosted several visits from overseas personnel who are interested to see and share the practices of EfSD. Various collaborative projects with the stakeholders have also been conducted ranging from forums, exhibitions and the training of trainers to strengthen and coordinate common understanding and plan for EfSD activities in the region.

The Transformation Strategies in Universiti Sains Malaysia

In the need to strategies it toward global excellence for the APEX programme, Universiti Sains Malaysia will, as a start, emulate and adapt approaches that have been successfully practised elsewhere. Since the early 2000s, the European Commission has set forth a plan to reform the universities based on several critical arguments to make EU universities more dynamic and competitive. In March 2000, the European Council organised a meeting on higher education in Lisbon with the aim of "making Europe and the EU the world's most dynamic and competitive economy and in respect of higher education, it has particularly focused on the knowledge and learning economy". Known as the Lisbon Strategy, this conference also aims at connecting innovation to research and development activities. As a result of this meeting, in May 2006 the European Commission recommended various strategies to reform higher education to ensure the breakdowns of barriers and impediments to the universities as well as to make European universities and research more visible and attractive in the world.

The recommended strategies include:

- Ensuring autonomy and accountability
- Providing incentives for partnership and business
- Providing "the right mix" of skills and competencies for the labour market

- Reducing the funding gap and making funding work more effectively in education and research
- Enhancing interdisciplinary and transdisciplinarity
- Facilitating the interaction of knowledge and society
- Rewarding excellence

The above strategies are obviously aimed at capturing the world-class label for the European universities. At another conference held later in London in June 2006, the specific aim then was to position these universities to capture the top spot of the league tables of the Times Higher Education Supplement (THES) and the Shanghai's Jiao Tong University. For this purpose, the EC's Director General for Education and Culture suggested three approaches toward modernisation, namely (i) to give them the capacity to run their own lives with less bureaucracy and using block funding, (ii) to be more flexible and competitive about bidding for research funding, and (iii) to increase the scale and global scope (Deem et al., 2008:87). Another strategy which has been successfully adopted in the business world and which can be used as a model is what is known as the "Blue Ocean Strategy" (BOS) introduced by Kim and Mauborgne (2005). According to Kim and Mauborgne, 2005:4-5, The Blue Ocean Strategy is a concept defined as "[the] untapped market space, demand creation, and the opportunity for highly profitable growth" According to the authors, the "blue ocean" connotes the unknown market space which is untainted by competition. It is also a metaphor to describe the wider, deeper potential of market space that is yet to be explored. This strategy requires the industry to expand its existing boundaries and change the rules of the game which, in turn, will render competition irrelevant.

The authors suggested that rather than fight over space and competition as is happening in what they referred to as the "Red Ocean" (in which the boundaries of the industries are defined and accepted and the competitive rules of the game are known), businesses and institutions should create their own market space and demand. A blue ocean is created when a company achieves value innovation that creates value simultaneously for both the buyer and the company. One has to find the value that cross conventional market segmentation and offers more value and lower cost. Demand is created rather than fought over and there is ample opportunity for every entity to grow. On this note, the authors argued, "To maximise the size of their blue oceans, companies need to take a reverse course. Instead of concentrating on customers, they need to look to non customers. And instead of focusing on customer differences, they need to build on powerful commonalities in what buyer's value. That allows companies to reach beyond existing demand to unlock a new mass of customers that did not exist before" (Kim and Mauborgne, 2005:102).

This suggests that it is almost impossible for fledgling businesses and institutions, including universities, to play the catch-up game and be at par with more advanced and established competitions. Some examples used by Kim and Mauborgne (2005) to support this strategy which has created new market spaces are *Cirque du Soleil* (which blends opera and ballet with the circus format), *Southwest Airlines* (which offers flexibility of bus travel at the speed of air travel using a secondary airport) and *Home Depot* (which offers competitive prices for a range of lumber yard products hand-in-hand with consumer classes to help buyers with DIY projects). In higher education, Universiti Sains Malaysia could take a leading role in transforming itself using the BOS. Sustainability in higher education, for all intents and purposes, is a blue ocean opportunity.

Another strategy which has been successfully adopted in the business world and which can be used as a model is what is known as the "Blue Ocean Strategy" (BOS) introduced by Kim and Mauborgne (2005)¹⁷. The Blue Ocean Strategy is a concept defined as "[the] untapped market space, demand creation, and the opportunity for highly profitable growth" (Kim and Mauborgne, 2005:4-5). According to the authors, the "blue ocean" connotes the unknown market space which is untainted by competition. It is also metaphor to describe the wider, deeper potential of market space that is yet to be explored. This strategy requires the industry to expand its existing boundaries and change the rules of

the game which, in turn, will render competition irrelevant. Other than that, another strategy would also include the bringing in of “towering professors” who can stimulate the impetus of research at Universiti Sains Malaysia towards sustainability with the balanced approach of social and economic impact. These solutions when practised and shared among Asian countries may finally turn around the world impact of having Asia in the lead.

Looking back at the approaches available, it is therefore apparent to Universiti Sains Malaysia that its transformation strategy will consist of two primary foci: Transforming the three pillars of a world renowned higher education institution, namely the concentration of talent, the abundance of resources and the acculturation of supportive governance, and Transforming the output/outcome necessary to be world renowned. Underlying these focused areas is the overall paradigm of blue ocean thinking as well as the approach taken by the European universities. This means that Universiti Sains Malaysia will realign itself in the transformation process to move into uncharted space and untapped markets. This allows the university to grow and innovate unimpeded by competition, through the creation of new demands by introducing new value innovation and opportunities. In so doing, the university will seek greater autonomy, provide the right mix of skills and competencies for the sustainable economy, reduce funding gaps and make funding work more effectively in education and research, enhancing interdisciplinarity and transdisciplinarity, facilitate the interaction of knowledge and society and reward excellence. All these will be carried out within the context of sustainability-led education and research.

Taking cognisance of the need to navigate Universiti Sains Malaysia toward sustainability led education, the university will adopt a stance that conducts science for humanity, which in essence fuses science and technology with the arts and humanity. The focus will now be on research outcomes that will enhance sustainability that includes reducing inequity and increasing availability, affordability, accessibility and quality of our innovations to those who need them most – the people in the bottom billion. In addressing local problems, Universiti Sains Malaysia will in essence also provide solutions to global problems. It is therefore important that USM’s strategy is focused on addressing global problems such as energy security, water security, food security and the wellness paradigm, to name a few. The current global food and energy crises are cases in point.

They require urgent attention. In channeling the energy to work on a bigger agenda, the university will encourage the fundamental and the applied with researchers working together towards a common goal. Working on local problems will finally create the significant impact that sustainable society needs to see from local researchers.

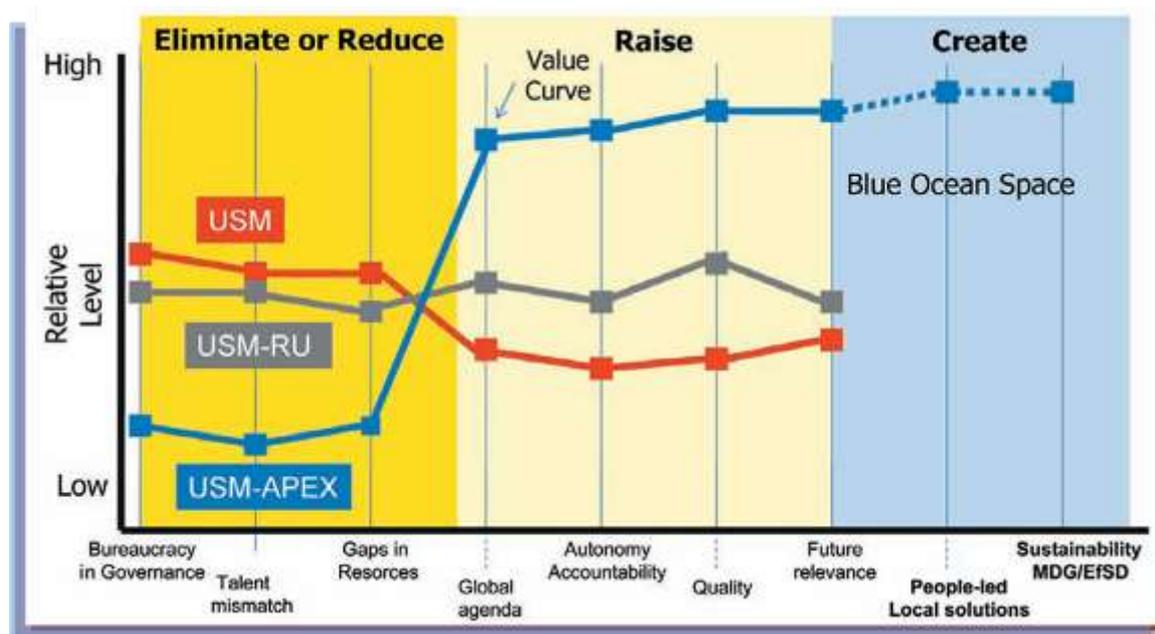


Figure 7. General strategy canvas for Universiti Sains Malaysia

Source Abdul Razak and Mohamed (2008)

To realise this strategy and as shown in Figure above USM-APEX (in blue dotted line) will undertake a strategy to innovate to promote new “markets” for knowledge by introducing sustainability-led education through creating new demands which focus on the needs of the masses at the bottom of the pyramid. Following the blue ocean strategy, as shown in Figure below, Universiti Sains Malaysia will take steps to transform itself by eliminating or reducing bureaucracy, reducing the funding gap and talent mismatch whilst raising the global agenda, autonomy and accountability, quality and future relevance, creating “people-led” local solutions for global problem, thus creating sustainability, in conformance to the indicators exemplified by the MDGs and EfSD.

The transformation strategy consists of two primary foci, namely (i) transforming the output/outcomes necessary to be world renowned in sustainable development, and (ii) transforming the three pillars of higher education, namely the concentration of talent, the abundance of resources and the acculturation of supportive governance (Salmi, 2006). In transforming Universiti Sains Malaysia for the APEX programme, the university is reviewing its activities in all areas, including nurturing and learning (commonly known as teaching and learning), research and innovation, consultancy and services, postgraduate studies, and students and alumni. This review will particularly address the seven thrusts of the National Higher Education Action Plan (MoHE, 2007), in terms of:

- Widening access and enhancing equity
- Improving the quality of teaching and learning
- Enhancing research and innovation
- Strengthening the institution
- Intensifying internationalisation
- Enculturation of lifelong learning
- Delivery system



Figure 8. Transforming Higher Education in Universiti Sains Malaysia

Source: Abdul Razak and Ramli Mohamad (2008)

ANNEX E
Summary of Northern Corridor Economic Region (NCER) Project



The Northern Corridor Economic Region (NCER) project will see the transformation of Penang into a modern, vibrant city and a major logistics and transportation hub.

Penang Sentral Integrated Transport Hub

The RM2bil modern transportation and logistics hub will be built on the site of the Butterworth ferry terminal, railway station and former bus terminal which burnt down in May 2001. The project, which aims to transform Butterworth into a modern metropolitan area, covers 557,418 square metres and will replace the current Butterworth ferry terminal and railway station. The hub will integrate rail, ferry, monorail and land transport modes. The project will be developed by Malaysian Resources Corporation Bhd and Pelaburan Hartanah Bumiputra Bhd. The first phase, involving the integrated transport and commercial outlets, is expected to take off next year and be completed in 2010. In the interim, a RM5mil temporary bus terminal will be built at the site.

Penang Global City Centre

The project will transform the site where the Penang Turf Club now stands in Bukit Gantung, George Town. It will be a modern city centre tailored for meetings, incentives, conventions and exhibitions. Besides an international exhibition and conference centre, the RM18bil project will also have shopping complexes, two five-star hotels, commercial and residential properties, a state-of-the-art cultural centre and a 10.5ha park. The project, which will occupy a 105ha site, is being developed by Abad Naluri Sdn Bhd, an associate company of Equine Capital Bhd, and will take 15 years to complete. The project is expected to create 5,000 construction jobs.

Second Penang Bridge

Announced earlier, the RM2.8bil second link between the mainland and Penang will be 23km long and link Batu Kawan in Seberang Prai with Batu Maung on the south-eastern corner of the island. Construction of the longest bridge in South-East Asia is expected to start in November and be completed in 2011. It will be built under a joint-venture between UEM Builders Bhd and China Harbour Engineering Co Ltd. China will provide a US\$800mil (RM2.8bil) loan to the project, the largest amount given by China for a single project in a foreign country.

Pulau Jerejak Premier Medical Tourism Centre

The 362ha Island off the east coast of Penang Island will be developed into a premier medical tourism centre in the region. This is part of efforts to enhance Penang's strength in medical tourism. Suitable incentive packages will be provided to develop the medical tourism industry to make it an engine of growth in the NCER.

Penang-Butterworth Fast Ferry

A fast ferry service will be introduced for pedestrians and motorcycles next year as an addition to the present Penang ferry service. The ferry terminals at Butterworth and on the island will be upgraded.

Penang Port Expansion

Penang Port will be promoted as the leading port of the Indonesia, Malaysia, Thailand Growth Triangle (IMT-GT). Facilities at the port will be upgraded so that it will be able to handle more containers and bigger container ships.

Bayan Lepas Airport Expansion

The Bayan Lepas Airport will be made the premier air cargo hub in the IMT-GT and will handle high quality perishable food items. A new passenger and cargo terminal and additional runways will be built to cater for increasing air traffic.

Penang Monorail

The monorail network will span a total of 37km. It will reduce traffic congestion on the island and in Seberang Prai.

Swettenham Pier Development

Swettenham Pier in George Town will be redeveloped into a new public transport system and commercial hub.

Microelectronics Centre of Excellence

The centre will be built at the Universiti Sains Malaysia campus under a public private partnership. This centre will help enhance the capability of local workers to shift from low level manufacturing and assembling activities to value-added high technology activities such as design of electronic, robotic and silicon items.

Source: Malaxi, <http://www.malaxi.com/penang/ncer/index.html>

ANNEX F

**Questionnaire on review Higher Education Institutions in Regional Development for Chapter 3:
Contribution of Research to Regional Innovation**



**QUESTIONNAIRE
ON
REVIEW OF HIGHER EDUCATION INSTITUTIONS
IN REGIONAL DEVELOPMENT**

**CHAPTER III:
CONTRIBUTION OF RESEARCH TO REGIONAL INNOVATION**

NAME OF RESPONDENT: _____

DEPARTMENT OF RESPONDENT: _____

DESIGNATION OF RESPONDENT: _____

DATE OF INTERVIEW: _____

INTRODUCTION OF THE QUESTIONNAIRE

The aim of this questionnaire is to gather the opinions of the university higher personnel on the contribution of research to regional innovation. In this questionnaire region is understood as Penang State.

The questionnaire relates to the OECD/IMHE Review of Higher Education Institutions in Regional Development-Presenting the Penang region/city-region project which is coordinated by the National Higher Education Research Institute (NAHERI).

We would like to invite you to complete the enclosed questionnaire and return it by e-mail to zituakmar@notes.usm.my by 20th April 2009. If you would like further information about the questionnaire or the project, please contact our group leader; Dr. Sabariah binti Ismail at ext. 3783 or 60124897210 (mobile number).

Part 1: Understanding Regional Development in General

Q1. Write down 5 words or short sentences that describe regional innovation.

1. _____
2. _____
3. _____
4. _____
5. _____

Q2. Define 5 methods, tools or ways with which your university can contribute regional Innovation at the regional level.

1. _____
2. _____
3. _____
4. _____
5. _____

Q3. How does regional innovation fit into universities' basic tasks? (Cross one alternative from the following scale: 1= doesn't fit and 5= Fits extremely well)

1: 2: 3: 4: 5:

Part 2: Responding to Regional Need and Demands

Q4. How would you describe your university's role in regional innovation?

Weak:

Neutral:

Influential:

Q5. Does USM has a research policy/strategy? Yes (0) No (1)

Q5a. If yes, please elaborate:

Q6. Does Universiti Sains Malaysia research policy/strategy have a regional dimension? Yes (0)

No (1)

Q6a. If yes, to what extent do USM draw upon the characteristics of the region to develop research activity? And how would you describe its implementation in practical level inside the university? (Please choose/select the appropriate answer)

- Policy/strategy is only a paper with no practical implementation 0
- There has been some attempt at implementation 1
- Implementation has strengthened work with local or regional actors 2
- at some level Implementation has been a success Implementation has been a success 3
- Others please state 4

Q6b (i).What other regional partners/authorities are drawn into this process? Please name the 5 most important.

